



Access to Maternity and Obstetric Care in Rural Pennsylvania

By: Sharon Bernecki DeJoy, Ph.D., MPH, CPH, and David J. Doorn, Ph.D.

West Chester University of Pennsylvania

April 2022

This project was sponsored by a grant from the Center for Rural Pennsylvania, a legislative agency of the Pennsylvania General Assembly. The Center for Rural Pennsylvania is a bipartisan, bicameral legislative agency that serves as a resource for rural policy within the Pennsylvania General Assembly. It was created in 1987 under Act 16, the Rural Revitalization Act, to promote and sustain the vitality of Pennsylvania's rural and small communities. Information contained in this report does not necessarily reflect the views of individual board members or the Center for Rural Pennsylvania. For more information, contact the Center for Rural Pennsylvania, 625 Forster St., Room 902, Harrisburg, PA 17120, telephone (717) 787-9555, www.rural.pa.gov.

Executive Summary

This study examined access to maternity care in rural Pennsylvania. Maternity care (also known as obstetric care) can be defined as health care services delivered to women during pregnancy, childbirth, and the postpartum. Access to maternity care is defined as the availability of birthing facilities (hospitals or birth centers) and practitioners (physicians and midwives) providing these health services.

To examine access to maternity care and explore solutions for increasing access, this study analyzed federal and state-level data to determine the distribution of birthing facilities and birth attendants in the Commonwealth. It also conducted a workforce analysis to forecast the supply of and demand for care providers and identify gaps where supply will not meet demand. Finally, it surveyed stakeholders and key informants to identify strengths, weaknesses, opportunities, threats, and solutions to improving access to maternity care.

Key findings:

- There is projected to be no increase in the supply of obstetricians in rural practice over the next five years.
- There will be growth in the number of midwives and family practice physicians in the next five years; using these professionals to provide maternity care may partially ameliorate the shortage of obstetricians.
- Eighteen rural Pennsylvania counties are or are forecasted to be “maternity care deserts,” where there are not enough providers to ensure access for all pregnant persons.

- Nineteen rural Pennsylvania counties have hospitals that do not provide obstetric services, and no accredited freestanding birth centers are located in any of these rural counties.
- The demand for maternity care will decrease over the next five years, as the population of rural Pennsylvania continues to decline, particularly the population of women of childbearing age.
- Elimination of “maternity care deserts” is unlikely to occur, given current patterns of practice.

These findings suggest three broad areas for policy development and implementation by the Pennsylvania General Assembly and other offices of the Commonwealth:

- Recruit more maternity care providers to work in rural areas;
- Encourage innovation in interprofessional maternity care models; and
- Strategically maintain and place resources for maternity care in locations where they are scarce.

All three policy areas will require inventive consideration of how health care providers are trained and licensed, as well as how they are recruited and retained. Similarly, the challenge of ensuring high quality rural maternity care will involve the creative design of systems of care for pregnant people and their families. A cross-cutting theme across all three areas is the development of funding mechanisms that support innovative system redesign.

Table of Contents

- Introduction..... 6
 - Birthing Facilities..... 6
 - Maternity Care Providers 9
 - Access to Care and Birth Outcomes 11
- Goals and Objectives 12
- Methodology..... 14
 - Goal 1: Supply, Demand, and Gap Analysis 14
 - Goal 2: Health Outcomes and Facilities 19
 - Goal 3: Situation Analysis 19
- Results..... 22
 - Goal 1: Supply, Demand, and Gap Analysis 22
 - Goal 2: Health Outcomes and Facilities 49
 - Goal 3: Situation Analysis 69
- Conclusions..... 75
 - Goal 1: Supply, Demand, and Gap Analysis 75
 - Goal 2: Health Outcomes and Facilities 76
 - Goal 3: Situation Analysis 76
- Policy Considerations 77
- References..... 79

Appendix A: Demographics of Situation Analysis Respondents 84

Appendix B: Glossary..... 86

Appendix C: Semi-Structured Interview Guide..... 90

Introduction

This study was conducted to identify and forecast the supply of and demand for maternity and obstetric care in rural Pennsylvania and to determine any gaps in care. It also identified strengths, weaknesses, opportunities, and threats in overcoming that gap. *Maternity care* (also known as *obstetric care*) may be defined as health care services delivered to women during pregnancy, childbirth, and the postpartum (March of Dimes, 2020). *Access to maternity care* is defined as the availability of birthing facilities (hospitals or birth centers) and practitioners (physicians and midwives) providing these health services (March of Dimes, 2020). A glossary of other terms used in this report is provided in the appendix.

Birthing Facilities

Most rural women rely on local hospital-based maternity services for care, including labor and delivery units and newborn nurseries. However, 10 percent of rural counties in the U.S. have lost these services since the beginning of the 21st century. As of 2014, less than half of rural counties had obstetric services (Anderson et al, 2019). Less than one half of rural women in the U.S. live within a 30-minute drive to the nearest hospital offering maternity services (American College of Obstetricians and Gynecologists [ACOG], 2014). Both rural labor and delivery unit closures and rural hospital closures have contributed to this decline (Anderson et al., 2019).

Since January 2010, more than 100 rural hospitals have closed across the United States (Anderson et al, 2019). Analysis of these national trends showed closures were associated with multiple factors, including being in a lower income community, high rates of uninsured residents and uncompensated care, smaller hospital size, private hospital ownership, and a limited supply of providers who attend births (Anderson et al., 2019; Centers for Medicare and Medicaid

Services [CMS], 2019; Rural Health Research Gateway, 2019). Counties were more likely to lack hospital-based obstetrics services where there were fewer obstetricians (OB/GYNs) and family practice (FP) physicians, lower birth rates, and lower per-capita income. They also tend to be located in states with more restrictive Medicaid income eligibility thresholds (Rural Health Research Gateway, 2019).

Like health care costs in general, the cost of providing hospital-based obstetric services is increasing. However, reimbursement from insurers has not kept pace; Medicaid, in particular, which pays for half of all rural births, usually has lower reimbursement rates for childbirth than other insurers (CMS, 2019). On top of the many financial challenges facing rural hospitals, low reimbursement rates may encourage hospitals to cut labor and delivery services just to keep their doors open (Lewis, Paxton, & Zephyrin, 2019). While approximately 28 million women of childbearing age live in rural areas, the rural population, in general, is shrinking and fertility rates are going down, putting pressure on hospitals to cut low-volume services (Lewis et al, 2019).

Loss of obstetric services in rural counties is associated with preterm birth and women giving birth in hospitals without obstetric services. Should an emergency arise, these hospitals may not be equipped to deal with it (Rural Health Information Hub, 2021; Rural Health Research Gateway, 2019). Closures of obstetric services may also contribute to procedures that increase the risk of complications, such as early elective delivery using induction and cesarean section, because women want to avoid going into labor when they are a long drive from the nearest hospital (Lewis et al., 2019).

While women with pregnancy complications should give birth in hospitals, low-risk healthy women have the option of community (out-of-hospital) birth. Studies have shown that the infant mortality rate is similar for low-risk women who deliver in hospitals and those who

give birth in freestanding birth centers, with a lower rate of medical interventions and lower costs for birth in birth centers (Phillippi, Danhausen, Alliman, & Phillippi, 2018). Women who were Medicaid recipients who received prenatal care in Strong Start Birth Centers, an initiative of the U.S. Department of Health and Human Services, had better birth outcomes and lower costs than their peers who received usual care; specifically, lower rates of preterm birth, low birthweight, and cesarean section (CMS, 2019). There is a lack of birthing centers across Pennsylvania, particularly in rural counties (Pennsylvania Department of Health, 2020). There are four accredited freestanding birth centers in Pennsylvania, but all are located in urban counties; Bryn Mawr (Delaware), Reading (Berks), Womelsdorf (Berks), and Pittsburgh (Allegheny) (American Association of Birth Centers, 2016).

Women in rural areas are more likely to birth at home than women in metropolitan areas (Anderson et al., 2019). In Pennsylvania, slightly less than 2 percent of mothers planned a home birth (Birth Place Lab, 2019). While women in rural areas may give birth at home due to a perceived lack of other options, some women prefer this birth location. Women choose home birth for many reasons, including low cost, cultural or religious reasons, desire for holistic care, more personalized attention, a preference for less medical intervention, and location preference (no need to travel during labor and, for clients of midwives who make home visits, no need to travel for prenatal or postpartum care) (Vedam et al, 2018). Among the populations with a preference for home birth are Plain communities. Pennsylvania has an estimated Amish population of 81,000, including three of the largest settlements in the United States, two of which are in rural counties (Young Center, 2020). This estimate only includes buggy-driving Amish and does not include more progressive Amish denominations and Mennonites.

Better support is needed for home births (Pennsylvania Department of Health, 2020) because integration of midwives with the health care system improves birth outcomes (Birth Place Lab, 2019).

Because the availability of birthing facilities and birth attendants are dependent on each other, discussion of either is incomplete without mention of the other. Specifically, staffing challenges contribute to hospital closures since the cost to have obstetricians and anesthesiologists on call for emergency cesarean deliveries can be prohibitive for hospitals with low volume. Other staffing challenges include scheduling, training, census fluctuation, and recruitment and retention in non-metropolitan areas (Kozhimannil, Henning-Smith, Hung, Casey, & Prasad, 2016; Lagrew & Jenkins, 2014b).

Maternity Care Providers

Maternity care services can be provided by family physicians, general surgeons, obstetricians, and midwives. Family physicians and general surgeons are more likely to attend deliveries in low volume settings (hospitals with fewer than 240 births per year), while obstetricians and midwives are more likely to attend births in high-volume settings (Anderson et al, 2019).

Across the United States, there is a projected shortfall of physician specialists (including obstetricians) of between 21,000 and 60,000 by 2030, with 7,100 physician specialists needed in the northeast (Dall, West, Chakrabarti, Reynolds, & Iacobucci, 2020). The population of physicians is aging, and 40 percent will be of retirement age in the next decade, while newer specialists tend to work fewer hours in search of work/life balance (Dall et al, 2020). Rural Pennsylvania has a higher proportion of physicians over the age of 75 than non-rural counties (22 percent versus 17 percent) (Rural Health Information Hub, 2021).

The U.S. Department of Health and Human Services' Health Resources and Services Administration (HRSA) expects a national shortage of 4,930 full-time-equivalent obstetricians/gynecologists in 2025 (2016). While these projections include a surplus of obstetricians in the Northeast, they do not include rural/urban disparities. Nationally, only 8 percent of obstetricians report being in rural practice, and distribution of obstetricians tends to cluster around major metropolitan areas (CMS, 2019; March of Dimes, 2020). In 2017, about half of all counties in the U.S. lacked an obstetrician, and nearly 40 percent lacked an obstetrician or certified nurse midwife (CNM) (CMS, 2019; March of Dimes, 2020).

Projected supplies of CNMs are expected to exceed demand in 2025, resulting in a national surplus (HRSA, 2016). Midwifery care has been recognized as providing excellent outcomes for mothers and babies at low cost (CMS,2019; MOD,2020; Vedam et al., 2018). Increased use of midwives and other non-physician providers and their integration into the maternity care system can help fill the projected shortfall of obstetricians (CMS, 2019; HRSA, 2016, March of Dimes, 2020).

However, there are barriers to midwifery practice in the United States, including the complex and diverse nature of midwifery practice regulation across jurisdictions. While all 50 states recognize the legal right to practice for Certified Nurse Midwives (CNMs), many states require supervision or a collaborative agreement from a physician rather than allowing independent practice (CMS, 2019; Vedam et al, 2018); if there is no physician who is able or willing to provide collaboration, the CNM's ability to practice is restricted. 49 Pa. Code § 18.5. requires such collaborative agreements for CNMs in the Commonwealth. Regulation of direct-entry midwifery (midwifery certification that does not require prior education in nursing) varies by state as well; only six states recognize certified midwives (CMs)

(CMS, 2019). Pennsylvania is not one of these, even though one of the master's programs that trains CMs is located at Thomas Jefferson University in Philadelphia. Certified Professional Midwives (CPMs) have a path to licensure in 34 states (National Association of Certified Professional Midwives (NACPM), 2020). In Pennsylvania, a 1929 law, the Midwife Regulation Law (Act P.L. 160, No. 155), statutorily allows direct-entry midwifery practice, but there is no current mechanism for licensure.

Pennsylvania ranks 39 out of 50 states in midwifery integration (Birth Place Lab, 2019). State regulations that support fuller integration of midwives into the health system are associated with more midwife-attended births and lower rates of obstetric interventions, preterm birth, low birth weight infants, and infant death. They are also associated with increased breastfeeding rates and lower cesarean delivery rates, which can yield significant cost savings to the health care system (Vedam et al., 2018).

Access to Care and Birth Outcomes

Lack of access to maternity care can have serious consequences for maternal child health (ACOG, 2016). A healthy birth outcome for both the mother and baby starts long before pregnancy and can be achieved when providers identify and manage chronic conditions like diabetes and hypertension and can provide education to patients about healthy behaviors prior to conception (CMS, 2019). During the prenatal period, the need for access to maternal health services intensifies because prenatal care can improve birth outcomes for both the mother and child (CMS 2019). Delayed or inadequate prenatal care is associated with higher rates of perinatal complications (CMS, 2019). During labor and delivery, women need access to providers who can detect and treat potential complications (such as fetal distress, hemorrhage, and labor that does not progress normally) and transfer patients to higher levels of services if

necessary (CMS, 2019). In the postpartum period, women are adapting to motherhood physically and emotionally (CMS, 2019), which sometimes involves breastfeeding difficulties and postpartum mood disorders. However, up to 40 percent of women do not complete a postpartum check-up, particularly in rural areas where travel distance, limited transportation, and a lack of childcare for older children may make access difficult. (CMS, 2019).

For the reasons noted above, lack of access to maternity care is dangerous for mothers and infants. The United States has one of the highest rates of maternal mortality (death of mothers due to pregnancy-related causes) among high-income countries, of which 60 percent is avoidable (March of Dimes, 2020). Rural mothers are at high risk for complications related to childbirth that compromise their own health (ACOG, 2016). Women living in rural areas and their infants are at increased risk for problems that contribute to infant mortality, including inadequate prenatal care, low birth weight (LBW), and preterm birth (PTB) (ACOG, 2016; CMS, 2019; March of Dimes, 2020).

To improve maternal and child health in the Commonwealth, this study described access to obstetric care in rural Pennsylvania through a gap analysis between supply of and demand for obstetric services. This research used a quantitative approach to estimate demand for obstetric services in rural Pennsylvania and supplemented that data with a qualitative analysis of opportunities and challenges to meeting that demand.

Goals and Objectives

This research had three main goals; the first was to conduct a workforce analysis of maternity services in rural Pennsylvania, supplemented by additional goals of mapping the distribution of facilities and providers and conducting a situation analysis of the landscape for

recruiting and retaining providers. The research used the Center's definition of rural as follows: a municipality is rural when the population density within the municipality is fewer than the 2010 statewide average density of 284 people per square mile, or the total population is less than 2,500, unless more than 50 percent of the population lives in an urbanized area as defined by the U.S. Census Bureau. All other municipalities are considered urban.

Goal 1: To conduct a workforce analysis of maternity services in rural Pennsylvania.

Objective 1.1 Calculate the demand for maternity care practitioners in rural Pennsylvania.

Objective 1.2. Calculate the current and projected supply and distribution of maternity care providers in rural Pennsylvania.

Objective 1.3. Conduct a workforce gap analysis between the supply of and demand for maternity care providers.

This goal and associated objectives were achieved by analyzing secondary data from a variety of federal and state sources.

Goal 2: To identify the current distribution of obstetrics facilities in rural Pennsylvania.

Objective 2.1. Map the supply of obstetrics (labor and delivery units, newborn nurseries and Neonatal Intensive Care Units) facilities in rural Pennsylvania, identifying areas where services are unavailable.

This second goal and its associated objective were achieved by analyzing data from the Pennsylvania Department of Health annual hospital reports. While examining the distribution of

facilities in Pennsylvania, the researchers identified a need to examine the distribution of poor health outcomes in rural areas, as well. This need created a supplemental objective in addition to those originally proposed:

Objective 2.2. Map the distribution of poor birth outcomes in Pennsylvania.

Goal 3: To identify the strengths, weaknesses, opportunities, and threats inherent in delivering maternity services in rural Pennsylvania and identify how policy can capitalize on the opportunities and minimize the threats.

Objective 3.1 Conduct a stakeholder survey, key informant interviews, and a literature review of best practices.

Methodology

This research used a mixed-method approach to achieving its goals and objectives, including a gap analysis of provider supply and demand, supplemented by a situation analysis for meeting the gap. Therefore, the discussion of methodology was broken down by the specific methods used to achieve each goal.

Goal 1: Supply, Demand, and Gap Analysis

“Future supply and demand for women’s health services will likely be affected by a host of factors, including population growth and aging, changes in birth rates, overall economic conditions, changes in health care delivery, and availability of the health workforce.” (HRSA, 2016).

This section lays out the necessary background material for the demand and supply analysis of maternity care services. In general, methods followed select prescriptions for

conducting such analyses that are laid out in a framework given in Chapter 3 of the Health Workforce Analysis Guide, 2016 Edition (Wing et al., 2016). This guide gives a variety of suggested procedures for undertaking such work at different levels of complexity. This report highlights a mix of procedures from across the three levels – *basic*, *intermediate* and *advanced* – given in their framework, which is fairly common in the literature. Each of the following sections describes the procedures used in this study as cited in the guide.

Demand: The guide (Wing et al., 2016) defines *demand* to be patients’ willingness to purchase services from health care providers, a standard economic definition of the term. It then goes on to separately define *need* as representing “a normative judgment about the ideal number of workers that should be available to provide health services in a particular area or to a particular population to keep them healthy, regardless of their ability to pay” (See Wing et al., 2016, p. 22). In practical terms, these components of overall demand for health services overlap, and the guide combines them in its analysis, as does this report.

Table 1. Data Sources and Methods for Demand Calculations

Level of Analysis	Methods and Data
Basic Analyses	<ul style="list-style-type: none"> ○ Population counts and characteristics for state and counties. <ul style="list-style-type: none"> ▪ National population estimates were obtained from the U.S. Census Bureau. ▪ All county and state population and characteristic data were obtained through the Division of Health Informatics, Pennsylvania Department of Health, using the Enterprise Data Dissemination Informatics Exchange (EDDIE), available online at https://www.health.pa.gov/topics/HealthStatistics/EDDIE/Pages/EDDIE.aspx. The Department specifically disclaims responsibility for any analyses, interpretations, or conclusions. ▪ Population data in EDDIE was sourced from the U.S. Census Bureau for 1990, 2000 and 2010 and from the Pennsylvania State Data Center at Penn State Harrisburg for non-census years. ○ Indirect measures of demand (such as numbers of pregnancies and births in this case)

	<ul style="list-style-type: none"> ▪ These also were obtained through EDDIE. ▪ Reported pregnancies data in EDDIE were sourced from the Pennsylvania Birth Certificate Dataset, the Pennsylvania Fetal Death Certificate Dataset, and the Pennsylvania Induced Abortion Dataset. ▪ Reported births data in EDDIE were sourced from the Pennsylvania Birth Certificate Dataset. <ul style="list-style-type: none"> ○ Charts, tabulations, and maps based on simple counts and comparisons of averages and population ratios.
Intermediate Analyses	<ul style="list-style-type: none"> ○ Estimates for population subgroups. ○ Historical trends and comparisons covering multiple years. ○ More detailed breakouts of demand statistics for different geographic regions and population subgroups. ○ Tables, graphs, and maps based on multiple variables.
Advanced Analyses	<ul style="list-style-type: none"> ○ Multivariate analyses of factors related to demand and need. ○ Projections of future demand generally involve advanced statistical techniques designed to reveal underlying patterns. ○ Results include computed indicators and projections requiring more sophisticated computation and data manipulations.

Supply: Employment numbers were used to account for supply of health care service providers, which fits the definition given in the guide (Wing et al., 2016).

Table 2. Data Sources and Methods for Supply Calculations

Level of Analysis	Methods and Data
Basic Analyses	<ul style="list-style-type: none"> ○ Licensees and employment. <ul style="list-style-type: none"> ▪ County data on health care service providers were from the Area Health Resources Files (AHRF), 2018-2019, constructed by the U.S. Health Resources and Services Administration (HRSA). ▪ The AHRF county level data were available at https://data.hrsa.gov/data/download?data=AHRF#AHRF. ○ Ratios and baselines. ○ State and substate counts. ○ Tables and maps.
Intermediate Analyses	<ul style="list-style-type: none"> ○ Historical trends. ○ More detailed breakouts of supply statistics for different geographic regions and population subgroups.
Advanced Analyses	<ul style="list-style-type: none"> ○ Projections of supply. ○ Multivariate analyses of aspects of supply.

Projections: All time-series forecasts for supply and demand in the sections that follow were calculated by the authors, except for certain supply-side elements. The authors' forecasts, along with the associated confidence intervals and goodness-of-fit statistics, were generated in Microsoft Excel using the FORECAST.ETS function, along with the FORECAST.ETS.CONFINT function. This approach applies a particular exponential smoothing method, known as the Holt-Winters additive model. Exponential smoothing methods use a weighted average of past observed data, with recent data given more weight in the analysis. This method breaks time series data into three additive components, which include the error (E), the trend (T), and the seasonality (S). As the research used annual data, there was no seasonality, so that component is always zero in the application. Alternative univariate time series forecasting methods were also attempted with other software packages. This included the Holt-Linear method, a double exponential smoothing method, and a few others as well. Based on goodness-of-fit statistics, and, by extension, the width of the confidence intervals, these proved to be inferior to the results obtained with the Excel FORECAST.ETS function.

Unfortunately, time-series data of sufficient and continuous length were unavailable for certain provider supply to be able to generate reasonable projections, even near-term. Instead, projected 10-year growth rates for Pennsylvania-specific employment in the provider categories of interest were obtained from Projections Central State Occupational Projections (www.projectionscentral.com). The research used the 2018-2028 long-term projections, which are based on Bureau of Labor Statistics national employment trends data. This external site was initially obtained through O*NET OnLine, which is sponsored by the U.S. Department of Labor, Employment & Training Administration. (See <https://www.onetonline.org/>.) From these estimated 10-year growth rate projections, the researchers calculated corresponding annualized

average growth rates and used them to project future employment in the provider fields. Unfortunately, the site does not provide confidence intervals for projected growth figures and there was insufficient information on the site’s forecast methodology to calculate them. Therefore, the best scenario in this case was to provide point estimates of potential future outcomes for those providers.

Table 3: Descriptive Statistics for the 2019 Populations in the Rural Pennsylvania Counties

<i>2019 Rural County Populations</i>	
Mean	70,360.44
Standard Error	7,224.39
Median	51,014.50
Standard Deviation	50,052.01
Range	202,418.00
Minimum	4,447.00
Maximum	206,865.00
Sum	3,377,301.00
Count	48

Gap analysis: In the final section of the results for Goal 1, supply and demand analysis results were used to conduct a gap analysis between the two. This analysis enabled a determination of projected shortages or surpluses in maternity services going forward. It is common in studies such as this to assume that supply and demand are in equilibrium in some base period, usually the latest for which data are available, and then base projections of any gaps between supply and demand on expected future trends in the components (Note: Wing et al., 2016, discuss this in their research guide. Also see U.S. Department of Health and Human Services, HRSA, National Center for Health Workforce Analysis, 2017, and Satiani et al., 2011, for examples.)

Goal 2: Health Outcomes and Facilities

To identify the current distribution of obstetrics facilities in rural Pennsylvania, data were obtained from Inpatient Hospital Unit Data for 2019 from the Pennsylvania Department of Health Hospital Reports and downloaded in Microsoft Excel. (See <https://www.health.pa.gov/topics/HealthStatistics/HealthFacilities/HospitalReports/Pages/hospital-reports.aspx>). Similarly, data on birth outcomes were downloaded from EDDIE. Using the downloaded Excel data sheets, the researchers created maps created using the U.S. Heatmap Generators (Someka Ltd., 2020). Some maps were acquired from sources where data were unavailable or proprietary; sources of these maps are cited under the map.

Goal 3: Situation Analysis

To conduct a situation analysis (David, 1993) of access to obstetric care in rural Pennsylvania counties, the study augmented the quantitative data from Goals 1 and 2 with a qualitative survey and key informant interviews.

Setting: Prior to data collection, approval for the study was sought from, and provided by, the Institutional Review Board at West Chester University of Pennsylvania. The research team used professional network contacts and internet search engines to identify hospitals, medical practices, rural clinics, community-based maternal child health organizations, human service organizations, and health-related non-profits located in the rural counties. For example, search terms might include “*name of county*” and “OB/GYN practices.” The research team then identified e-mail addresses and phone numbers, where available, for stakeholders within those organizations. Using the same method, e-mail addresses were also obtained for representatives from professional associations, medical school OB/GYN departments, and health-related

organizations that were located outside of the rural counties but had expertise in health care workforce and/or rural health issues.

Between November 9, 2020, and February 19, 2021, surveys were sent to stakeholders in 48 rural counties using the secure Qualtrics survey software. In all, surveys were distributed to 123 individuals. In the survey e-mail, recipients were asked to forward the survey to colleagues, but the number of surveys forwarded is unknown. A total of 27 surveys were received, for a response rate of 21.9 percent of surveys directly e-mailed to participants. To increase the response rate, each participant received two solicitations for the survey: one in November and one in January. When phone numbers were available for stakeholders, a phone call reminder was sent. A response rate of approximately 20 percent was not unexpected, although the researchers hoped that more stakeholders would respond to the survey, given the important nature of the topic. However, it should be noted that survey distribution took place during the COVID-19 pandemic, when many stakeholders were doing remote work and health care organizations may have been overwhelmed with complying with new policies and procedures.

The survey asked a few questions about stakeholder characteristics (e.g., employer, position, length of time working in Pennsylvania), perceived maternity care provider shortages, and perceived strengths, weaknesses, opportunities, and threats (David, 1993), as well as suggested solutions. Data were downloaded into an Excel spreadsheet for analysis and identifying information was removed. Because the survey was mainly qualitative, there are no statistics or statistical margins of error available for the data. The survey was not a scientific poll and used convenience and snowball sampling, so results may not be representative of the opinions of all rural maternity care stakeholders.

The survey asked recipients to provide additional contact information if they wished to be contacted for a key informant interview. Additionally, the e-mail stated that the researchers would conduct a phone interview in lieu of the survey upon request. Six individuals responded to the request for an interview in the survey and one requested an interview in lieu of a survey; seven stakeholder interviews were completed. Interview questions are provided in the Appendix. Interviews were conducted via Zoom by the principal investigator. After gaining informed consent, the interviews were recorded. Transcripts were generated by Zoom voice recognition, downloaded into Microsoft word, and corrected for accuracy.

Analytic Strategy: Analysis took a two-phased approach. The first stage took the form of structural coding, where a deductive approach was used for data analysis and the coding followed the structure of the interview guide (Wolff, Mahoney, Lohiniva, & Corkum, 2018). That is, rather than looking for themes that emerged from the data, the authors sorted the data into pre-identified categories related to strengths, weaknesses, opportunities, and threats, and solutions were read and compiled into respective lists. Second, the list of strengths, weaknesses, opportunities, and threats were condensed into themes using thematic analysis (Kiger & Varpio, 2020).

Literature Review: From June to August 2020, the research team conducted a literature review to identify promising practices in policy solutions to rural health workforce shortages. The literature review was updated in 2021 to include reports published in the second half of 2020 and early part of 2021. Using Medline and CINAHL databases, searches were conducted for search terms “rural” and “maternity care” or “obstetrics” and “policy.” Six peer-reviewed journal articles were identified that provided policy solutions to rural maternity care workforce shortages. In addition, an internet search was conducted using similar terms. The search identified reports published by academic institutions, national maternity care nonprofit

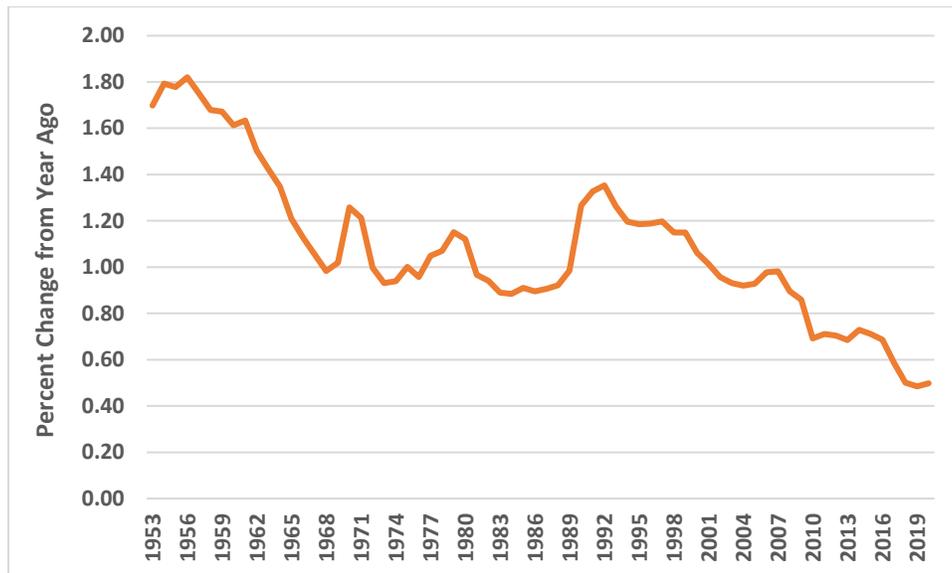
organizations, and the federal government that addressed rural maternity care workforce policies care shortages in general.

Results

Goal 1: Supply, Demand, and Gap Analysis

Demand: A discussion of larger population trends grounds the analysis of population trends in rural Pennsylvania. The U.S. population growth has slowed dramatically in recent decades. After the long run downward trend in the growth rate from the mid-1950s through the late 1980s, there was a brief uptick in population growth from the 0.92 percent annual growth in 1988 to the 1.35 percent rate in 1992. From there, the annual growth rate of the nation’s population has slowed to less than 0.50 percent in the most recent two years, ending at 0.4975 percent in 2020.

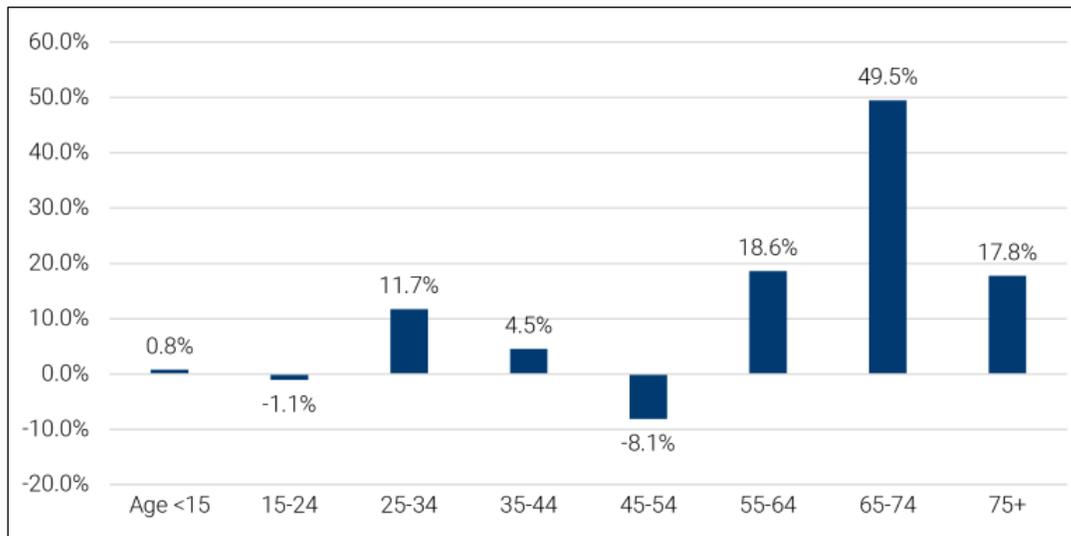
Figure 1: U.S. Population Growth, All Ages including Armed Forces Overseas, Annual



Data source: U.S. Census Bureau, National Population Estimates. Note: Figures for the period from 2010 to 2020 are estimates based on prior years and the 2010 Census. 2020 Census data were not available at the time of writing.

In addition to the decline in overall growth, the U.S. population is aging. The demographic containing women of childbearing age, typically considered to be those ages 15 to 44, has been experiencing relatively slow growth with respect to the overall population, with one of the subgroups in that range seeing declines. Note that the relatively high growth cohort of 25- to 34-year-old persons contains those born in the mini- “boom” years from 1988 to 1992 seen in Figure 1. Table 4 converts the 10-year growth rates in Figure 2 to annualized compound average growth rates for better comparison to the annual population growth rates shown in Figure 1.

Figure 2: Estimated U.S. Population Growth by Age, 2010 to 2020



Source: William H. Frey, *Analysis of 2010 U.S. Census and 2020 Census Bureau Demographic Analysis Estimates*, released December 15, 2020. Brookings Institution Metropolitan Policy Program. Found at <https://www.brookings.edu/research/what-the-2020-census-will-reveal-about-america-stagnating-growth-an-aging-population-and-youthful-diversity/>.

Table 4: 10-Year and Annualized Compound Average Growth Rates of Population by Age

Age Group	10-Year Growth Rate	Annualized Average Growth Rate
< 15	0.80%	0.08%
15-24	-1.10%	-0.11%
25-34	11.70%	1.11%
35-44	4.50%	0.44%

On a national level, the population of women of childbearing age will begin to decline in the not-too-distant future. Over the next decade, the fastest growing component, those ages 25 to 34, will enter the 35- to 44-year-old age range, while the declining growth cohort of those ages 15 to 24 will enter the 25- to 34-year-old age range. This, along with the very slow growth in the younger range moving into the 15- to 24-year-old age bracket, signifies a likely broad decline in births in the U.S. moving forward. This trend will result in even slower expansion of the overall population in the future, barring significant increases in fertility rates or major changes in immigration policy.

With a good grasp on the population growth situation nationally, the discussion moves on to that for Pennsylvania, with a focus on rural counties. Overall, Pennsylvania has experienced an even broader growth slow down than the nation over the past decade, with total population expanding only 0.57 percent from July 1, 2010, to July 1, 2020, according to Census Bureau estimates. The population actually declined in four of those years.

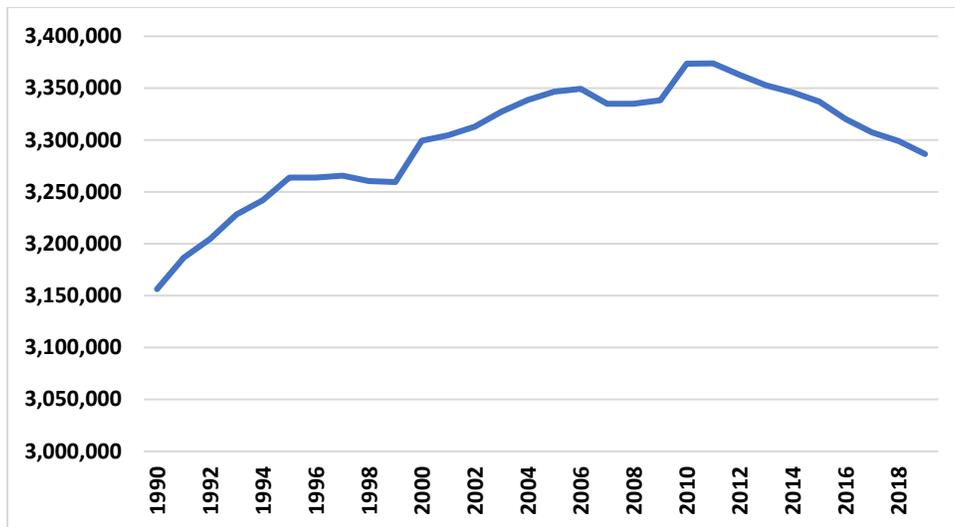
Table 5: Annual Estimates of the Resident Population of Pennsylvania, July 1, 2010 to July 1, 2020

Year	Population Estimate (as of July 1)	Annual Percent Change
2010	12,711,406	
2011	12,747,052	0.28%
2012	12,769,123	0.17%
2013	12,779,538	0.08%
2014	12,792,392	0.10%
2015	12,789,838	-0.02%
2016	12,788,468	-0.01%
2017	12,794,679	0.05%
2018	12,809,107	0.11%
2019	12,798,883	-0.08%
2020	12,783,254	-0.12%

Data source: U.S. Census Bureau, Population Division. Release Date: December 2020.

The population of rural Pennsylvania counties was trending upward through the 1990s and 2000s. However, this trend reversed over the past decade, with an overall decline of 2.59 percent in the rural population from 3.37 million in 2010 to 3.29 million in 2019.

Figure 3: Population of All Rural Pennsylvania Counties

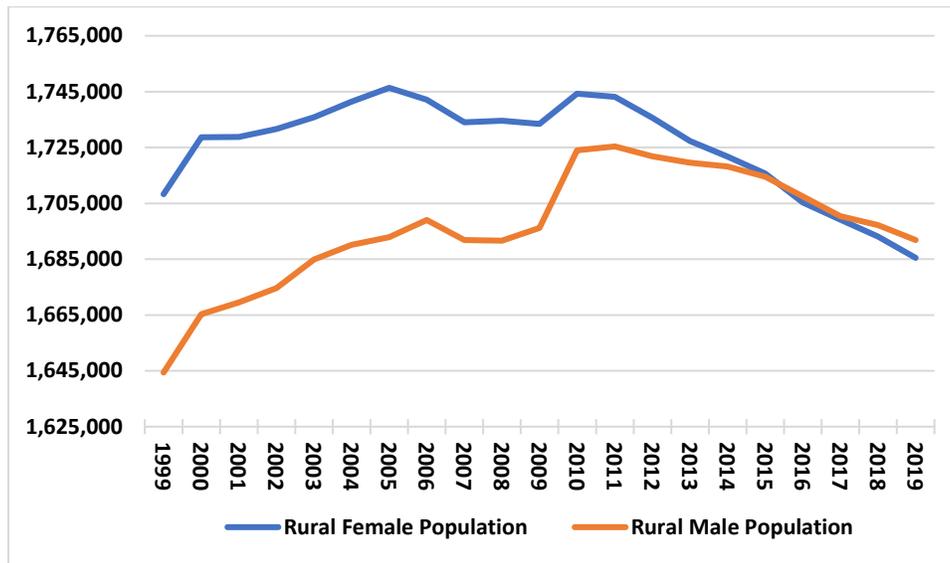


Note: The Y-axis begins at 3.0 million persons.

Data source: These data were provided by the Division of Health Informatics, Pennsylvania Department of Health, through the Enterprise Data Dissemination Informatics Exchange (EDDIE). The department specifically disclaims responsibility for any analyses, interpretations, or conclusions. Population data in EDDIE are sourced from the U.S. Census Bureau for 1990, 2000, and 2010 and from the Pennsylvania State Data Center at Penn State Harrisburg for non-census years.

As the main concern of this section is develop an understanding of the demand for maternity and obstetric services in these rural counties and to see how that has changed, looking at the gender breakdown of this rural population decline is also informative (See Figure 4). While the male population had seen growth for most of the decade prior to 2010, the female population seems to have plateaued in the mid-2000s and has been on the decline since 2010. Furthermore, the decline has outstripped that of the male population over that time period, with a drop in the female rural population of 3.37 percent from 2010 to 2019, versus a drop of 1.87 percent in the male population.

Figure 4: Population by Gender of All Rural Pennsylvania Counties

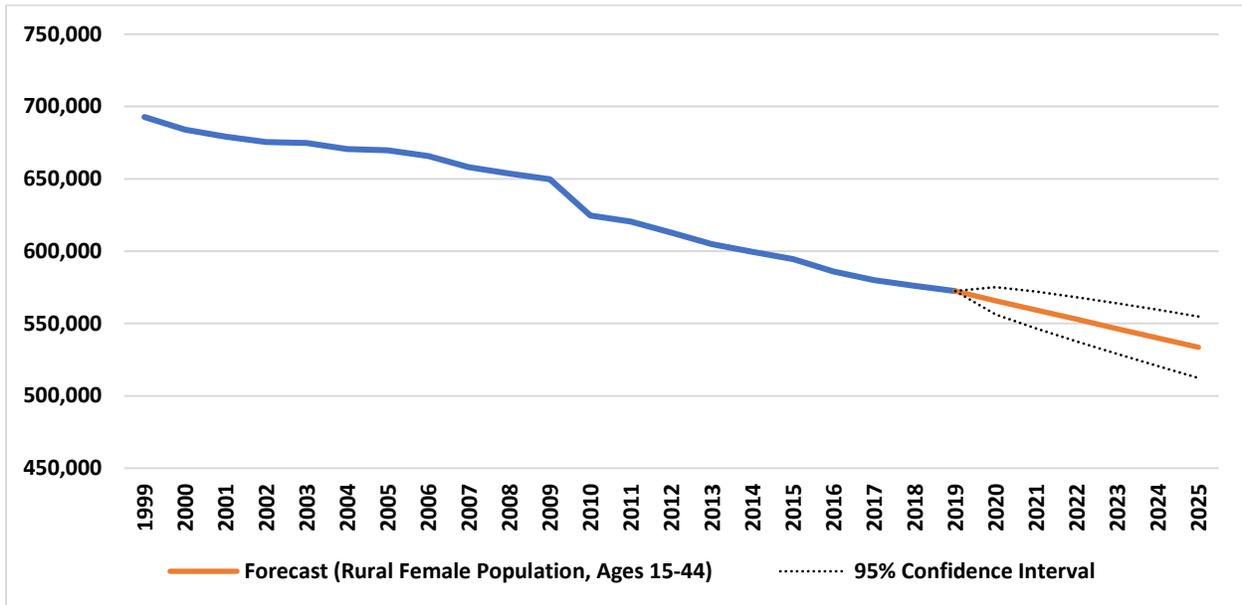


Note: The Y-axis begins at 1.625 million persons.

Data source: Division of Health Informatics, Pennsylvania Department of Health, through the Enterprise Data Dissemination Informatics Exchange (EDDIE).

More importantly for the purposes of this study, Figure 5 gives the population of females of childbearing age in rural Pennsylvania counties. There has been a significant decline over the past two decades in this population, and that decline is expected to continue. From 1999 to 2009, this population declined from 692,757 to 649,809, a drop of 6.20 percent. From 2010 to 2019 this population declined another 8.35 percent, from 624,559 to 572,441. Predictions were generated for the years from 2020 to 2025 in Figure 5. The point estimate for 2025 indicates a continuing decline of another 6.79 percent from the 2019 level.

Figure 5: Rural Population of Females, Ages 15 to 44, with Projections from 2020 to 2025

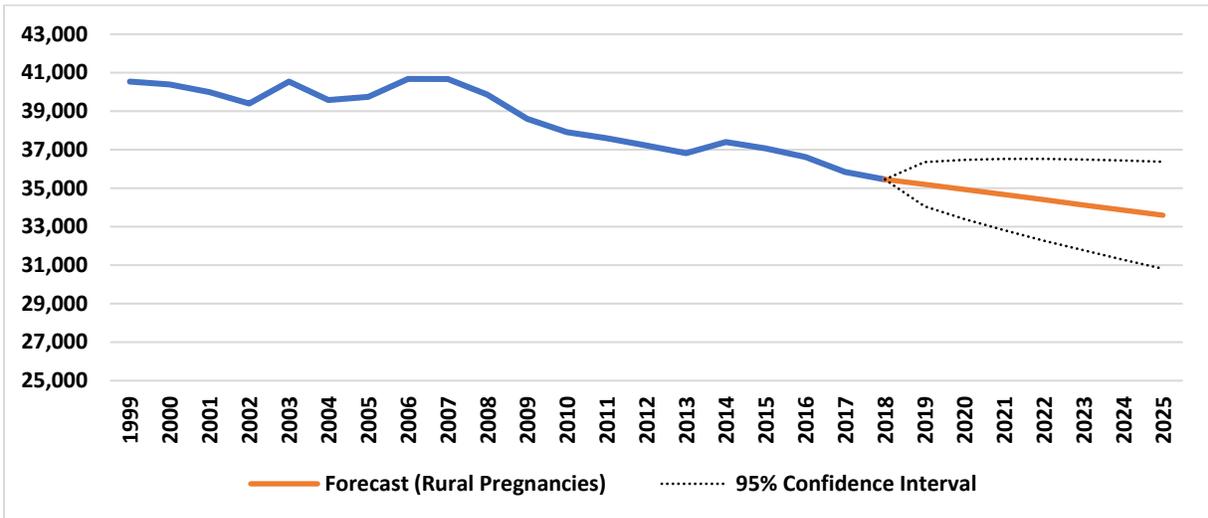


Note: The Y-axis begins at 450,000 persons.

Data source: Division of Health Informatics, Pennsylvania Department of Health, through the Enterprise Data Dissemination Informatics Exchange (EDDIE). Projections calculated by the authors.

Delving into even more detail on factors affecting the demand for maternity and obstetric services in Pennsylvania’s rural counties, Figures 6 and 7 indicate counts of rural pregnancies and rural births, respectively, from 1999 to 2018, along with predictions through 2025. (Total births to mothers younger than 15 and older than 44 years of age amounted to only 0.29 percent of all births in Pennsylvania in 2018. These age ranges are not included in the analysis.) Once again, there are significant declines in the measures, with rural pregnancies declining from a high of 40,676 in 2006 to 35,455 in 2018, a decline of 12.84 percent. Similarly, births in rural counties declined by 11.19 percent over that period, from 36,413 to 32,338. The declines are expected to continue, with a point estimate for births in 2025 of 30,941.

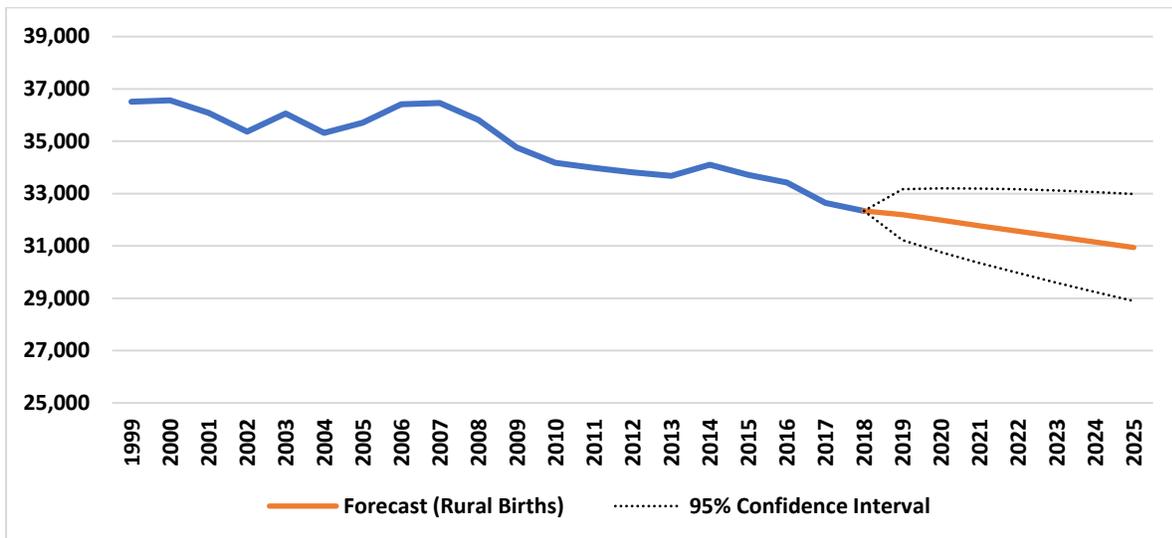
Figure 6: Rural Pregnancies, with Projections from 2019 to 2025



Note: The Y-axis begins at 25,000 pregnancies.

Data source: Division of Health Informatics, Pennsylvania Department of Health, through the Enterprise Data Dissemination Informatics Exchange (EDDIE). Projections are calculated by the authors.

Figure 7: Rural Births, with Projections from 2019 to 2025



Note: The Y-axis begins at 25,000 births.

Data source: Division of Health Informatics, Pennsylvania Department of Health, through the Enterprise Data Dissemination Informatics Exchange (EDDIE). Projections are calculated by the authors.

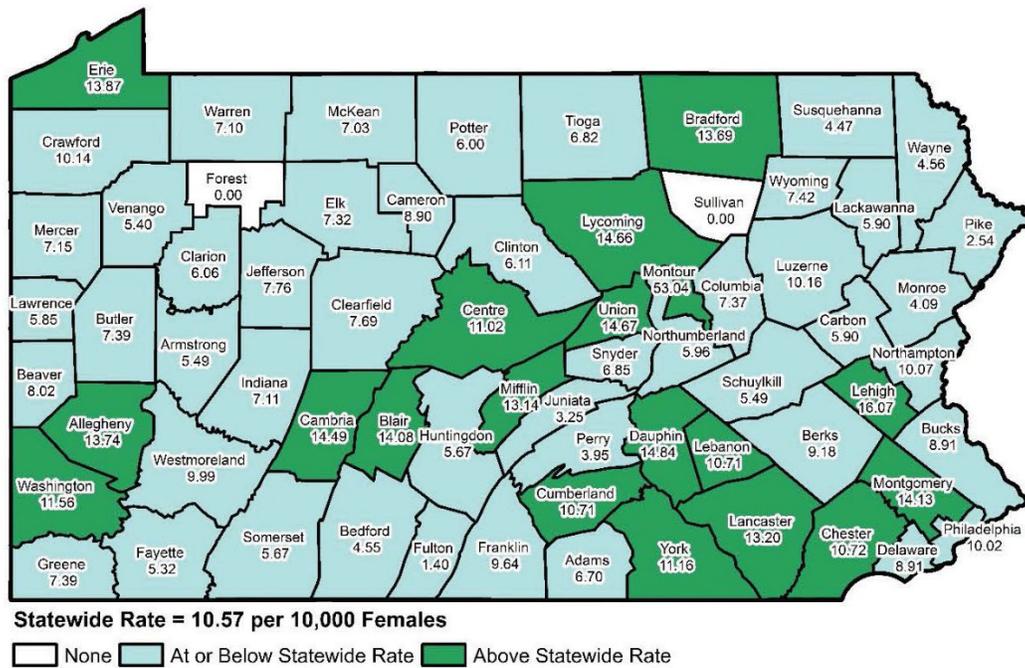
Taking all of the above into account, demand for maternity and obstetric services in rural Pennsylvania counties has been declining for some time and is expected to continue decreasing

in the future, at least until such time that population trends begin to move in the opposite direction. The next section looks at the supply of maternity care providers over much of the last decade, followed by an analysis of future potential outcomes for these services, given the trends in potential demand seen above and those indicated in the discussion of provider supply.

Supply of Maternity Care Services: The supply side analysis follows closely the March of Dimes' report (2020, p. 13) and designates maternity care service providers to include obstetricians and gynecologists (OB/GYN), certified nurse-midwives (CNMs), and family practice physicians, who are all capable of attending deliveries. (Due to data limitations, there are slight differences in these designations from those in the cited article.) Using county data on providers from the U.S. Health Resources and Services Administration (HRSA) Area Health Resources Files (AHRF), 2018-2019, in combination with the state population and birth data obtained through EDDIE (referenced above), the researchers constructed ratios to reflect the availability of such services in rural Pennsylvania counties. For comparison purposes, the researchers also included Pennsylvania's urban counties in the analysis.

Figure 8 shows the number of providers cited above in total per 10,000 females in each county in 2018. Two of the rural counties, Forest and Sullivan, have no providers at all, while 44 of Pennsylvania's 67 counties have fewer than 10 providers per 10,000 females. Eight rural counties have only from one to five providers per 10,000 females. Montour County, which is home to Geisinger Medical Center, has 53 providers per 10,000 females. (Montour County's total population in 2018 was 18,240 and the number of females was only 9,426, so clearly the medical center is meant to serve a much wider region.) Aggregating across all rural counties, the ratio of providers changed little from 2010, increasing from 8.24 providers per 10,000 females in 2010 to 8.35 in 2018.

Figure 8: OB/GYN + Family Practice + Nurse Midwives per 10,000 Females, All Ages, 2018



Data sources: For birth data, Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE). For practitioner data, U.S. Health Resources & Services Administration, Area Health Resources Files (AHRF), 2019-2020.

This research focuses on the supply of maternity care service providers available to women of childbearing age, or those ages 15 to 44 years old. With the aging population, that ends up being a relatively small subset of the overall female population, with the proportion averaging 32.87 percent across all rural counties in 2019, with a standard deviation of 3.87 percent. Table 6 indicates the ratio of the number of providers per 10,000 females of childbearing age in 2010, 2015, and 2018 for each county along with the change in this number from 2010 to 2018. Twenty-four of Pennsylvania’s 48 rural counties had fewer than 20 providers per 10,000 females of childbearing age, with Forest and Sullivan counties having no maternity care service providers in 2018. Also, 23 rural counties had from 30 to 50 providers per 10,000 females of childbearing age, as did 18 of the 19 urban counties. Montour County had 161.21 of

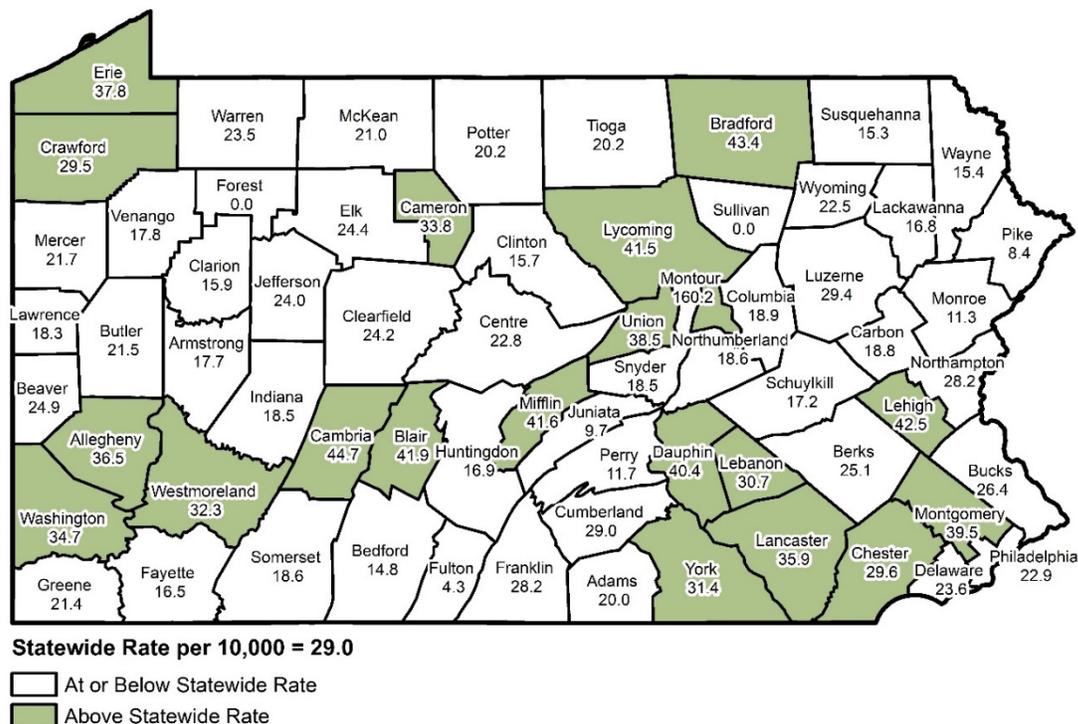
these providers per 10,000 females of childbearing age, but again this is because Geisinger Medical Center serves a much wider region than just its home county.

Table 6: OB/GYN plus Family Practice plus Certified Nurse Midwife Practitioners per 10,000 Females, Ages 15 to 44, and Change from 2010 to 2018

	2010	2015	2018	Change 2010-2018		2010	2015	2018	Change 2010-2018
All Rural	23.01	24.85	24.53	1.52	Juniata	16.46	14.63	9.70	-6.76
Adams	20.62	20.84	20.03	-0.59	Lackawanna	15.09	15.73	16.81	1.72
Allegheny	32.49	36.12	36.51	4.02	Lancaster	36.52	35.95	35.93	-0.59
Armstrong	15.60	17.74	17.65	2.05	Lawrence	21.56	19.00	18.30	-3.26
Beaver	23.95	25.02	24.95	1.00	Lebanon	33.57	33.90	30.71	-2.86
Bedford	18.10	15.59	14.83	-3.27	Lehigh	39.67	44.78	42.46	2.79
Berks	26.94	27.03	25.05	-1.88	Luzerne	27.97	29.50	29.41	1.45
Blair	40.16	43.87	41.92	1.76	Lycoming	39.68	41.11	41.52	1.83
Bradford	52.07	46.18	43.35	-8.72	McKean	14.65	18.19	21.00	6.35
Bucks	25.84	26.58	26.43	0.59	Mercer	23.66	22.65	21.74	-1.91
Butler	13.93	20.64	21.55	7.62	Mifflin	27.40	31.38	41.65	14.25
Cambria	41.82	46.61	44.73	2.90	Monroe	12.52	11.72	11.30	-1.22
Cameron	26.46	29.59	33.78	7.33	Montgomery	38.55	41.69	39.52	0.97
Carbon	19.76	19.39	18.82	-0.93	Montour	164.19	151.89	160.21	-3.99
Centre	17.45	19.63	22.85	5.40	Northampton	30.17	30.15	28.15	-2.02
Chester	25.68	28.82	29.59	3.91	Northumberland	14.01	17.13	18.55	4.55
Clarion	14.25	17.50	15.93	1.68	Perry	11.98	11.38	11.70	-0.27
Clearfield	18.58	24.61	24.25	5.67	Philadelphia	19.63	21.27	22.88	3.25
Clinton	15.15	18.87	15.73	0.57	Pike	12.35	8.15	8.35	-3.99
Columbia	22.13	20.15	18.93	-3.21	Potter	21.90	19.69	20.19	-1.70
Crawford	23.79	27.85	29.55	5.75	Schuylkill	16.56	15.23	17.16	0.60
Cumberland	29.58	30.96	29.02	-0.56	Snyder	24.48	23.58	18.53	-5.96
Dauphin	34.29	40.84	40.36	6.07	Somerset	22.95	24.66	18.63	-4.32
Delaware	26.91	24.19	23.59	-3.33	Sullivan	0.00	11.89	0.00	0.00
Elk	27.08	25.68	24.44	-2.64	Susquehanna	8.65	14.18	15.35	6.70
Erie	35.87	36.72	37.79	1.92	Tioga	21.84	24.26	20.18	-1.66
Fayette	19.54	20.71	16.50	-3.04	Union	36.72	43.02	38.48	1.76
Forest	0.00	0.00	0.00	0.00	Venango	17.66	21.39	17.78	0.11
Franklin	23.63	29.94	28.15	4.52	Warren	25.19	23.98	23.49	-1.70
Fulton	7.84	4.14	4.27	-3.57	Washington	30.44	33.17	34.72	4.28
Greene	10.03	17.21	21.40	11.36	Wayne	11.57	13.68	15.44	3.87
Huntingdon	24.98	17.91	16.87	-8.12	Westmoreland	29.10	32.23	32.32	3.22
Indiana	15.88	19.12	18.46	2.57	Wyoming	23.95	27.68	22.54	-1.40
Jefferson	25.78	25.95	23.95	-1.82	York	29.29	31.38	31.35	2.07

Source: AHRF 2019-2020. Boldfaced counties are urban.

Figure 9: OB/GYN plus Family Practice plus Certified Nurse Midwives per 10,000 Females, Ages 15 to 44, 2018

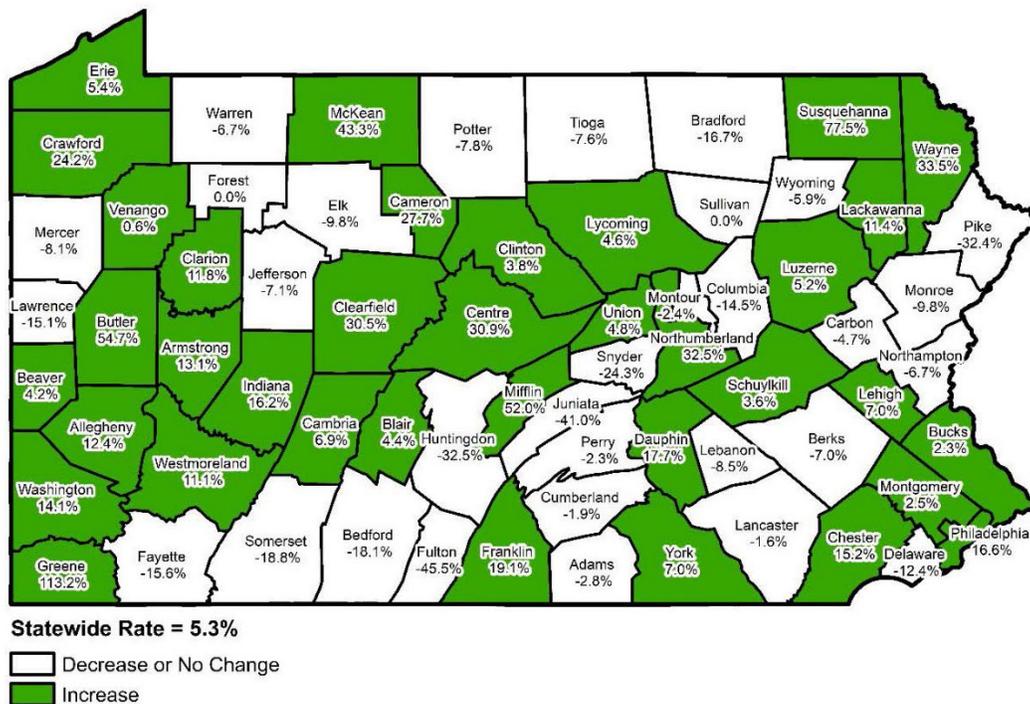


Data sources: For birth data, Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE). For practitioner data, U.S. Health Resources & Services Administration, Area Health Resources Files (AHRF), 2019-2020.

Of Pennsylvania’s 67 counties, 22 are above the statewide average with respect to the number of maternity care providers per 10,000 females of childbearing age. Twelve of these are urban counties, while the remaining seven urban counties range from 16.8 to 28.2 for provider ratios. The 10 rural counties that have ratios of providers above the 29 providers per 10,000 females include Crawford, Cameron, Washington, Union, Lycoming, Mifflin, Blair, Bradford, Cambria, and Montour. Twenty-five of the remaining 38 rural counties have provider ratios within the range limits of the seven below-average urban counties mentioned above, while the remaining 13 are well below the statewide average. Eight of these have fewer than 15 providers per 10,000 females, ages 15 to 44. This includes Forest and Sullivan counties, which have none.

Notably, the statewide average of providers from 2010-2018 showed an overall gain of 5.28 percent. Only six of the urban counties lost providers, with the biggest decrease occurring in Delaware County, which saw a decrease of 12.37 percent over the eight-year span. The remaining urban counties all saw gains in these ratios, with the largest being in Dauphin County, which had an increase of 17.70 percent in the number of providers per 10,000 females of childbearing age. Twenty-three rural counties saw increases over this period, ranging from a tiny increase of just 0.64 percent in Venango County to a dramatic increase of 113.22 percent for Greene County. Other than Forest and Sullivan counties, which saw no change from zero, the remaining 23 rural counties all saw declines, ranging from a slight fall of 2.27 percent in the provider ratio for Perry County to a large decline of 45.49 percent for Fulton County. In fact, 11 rural counties experienced declines in their provider ratios of greater than 10 percent from 2010 to 2018.

Figure 10: Percent Change in Number of Providers per 10,000 Females, ages 15 to 44, 2010 to 2018 – OB/GYN + Family Practice + Nurse Midwives



Data source: U.S. Health Resources & Services Administration, Area Health Resources Files (AHRF), 2019-2020.

Before moving on to the next section, it is useful to consider an alternative view of supply that uses actual births rather than the larger population of women of childbearing age. This is perhaps a truer indicator of the relative supply of maternity care service providers, given that 10-year average fertility rates per 1,000 women of childbearing age in rural Pennsylvania counties have been between 33 and 73.9. The middle 80 percent of counties had 10-year averages within a much tighter range of roughly 20, all centered on an average 10-year rate of 57.7 births per 1,000 females between the ages of 15 and 44. This trend indicates a lower overall demand for such services than do any of the above measures, and that demand is declining over time, as previously seen with the pregnancy and birth trends in Pennsylvania’s rural counties. This will be discussed in more detail in the next section.

Table 7: Average General Fertility Rates per 1,000 females ages 15-44 in Rural Counties over the Period 2008 to 2018

Mean	57.72	Minimum	33.02
Standard Deviation	7.41	Maximum	73.88
		10th Percentile	47.33
Range	40.86	90th Percentile	66.80

Data source: Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE).

Figure 11 shows the number of OB/GYN, Family Practice and Nurse Midwives per 1,000 births for each rural county in 2018. Three counties had fewer than 100 births in 2018: Cameron, Forest and Sullivan, at 37, 19, and 42 births, respectively. However, Forest and Sullivan counties also had no service providers fitting the definition. Cameron County had only two, which were Family Practice physicians. (The exhibited ratio of 54.05 providers per 1,000 births in Figure 11 for Cameron County is thus somewhat misleading.)

Sixteen counties have more than zero but fewer than 30 providers per 1,000 births and 35 counties have between 30 and 60 providers per 1,000 births. Another 13 counties have from 60 to 81 providers per 1,000 births, while Montour County is the only county that exceeds that, with

Demand and Supply Going Forward – A Gap Analysis: In the context of this study, a gap analysis is a look into the potential deviations from equilibrium between supply of maternity care services and demand for the same. Wing et al. (2016) state: “The bottom line for many health workforce studies is a determination of whether a shortage of practitioners of a particular health profession currently exists or will exist in the future. Generally, this determination is based on a comparison of supply and demand. If demand estimates exceed supply estimates, then the conclusion is that a shortage exists.”

As mentioned in the methods section, in health care research this undertaking usually requires designation of some base year in which supply is considered to satisfy demand, meaning they are in equilibrium, and then gaps are determined by any projected changes in these going forward. This base year is generally considered to be the latest period for which data are available. This research followed that convention, using 2018 as the base year. This means that the ratios of providers per 10,000 females of childbearing age for 2018 are the equilibrium ratios for each county. The gap analysis therefore looked at deviations from the 2018 ratio values in determining if shortages or surpluses, i.e. gaps, are likely to appear through 2025.

In keeping with the intentions of this research, this section only considers demand for maternity care services in terms of two measures: that pertaining to women of childbearing age and that pertaining to births. If the ratios of providers relative to these are projected to increase, it implies an expected surplus of providers in the future. On the other hand, if these ratios are expected to decrease the opposite is the case and shortages are likely to prevail. It is also possible that equilibrium is maintained.

While the researchers could provide reasonable forecasts for the demand side discussion, they could not do so for provider supply forecasts since data from only 2010, 2015 and 2018 are

available for OB/GYN and Family Practice. These data are insufficient for constructing forecasts for possible future outcomes for the number of providers of maternity care services. As a result, there were two possibilities for dealing with potential supply of maternity care service providers to consider going forward:

1. Consider supply to remain static through 2025. As this is a fairly short-term projection, it is not at all unreasonable for that to be the case. Satiani et al. (2011) make a similar assumption in their study of expected shortfalls in OB/GYN supply through 2030. Of course, there is the possibility of retirements and other reasons for providers to leave their positions. These are not accounted for here.
2. Apply projected growth rates obtained from other sources to the latest supply data, as stated in the methods section above. Some caveats to this approach include:
 - At best, these data are available only for Pennsylvania as a whole, and growth in employment in medical professions in rural areas tends to significantly lag behind that of urban areas. This means that results based on projected state growth rates will most likely overstate actual potential outcomes for changes in supply in rural counties.
 - Construct only point estimates for these growth rates, with no associated confidence bounds. This means it is not possible to construct range estimates for possible future employment outcomes, only point estimates.

The following section undertook each of these approaches separately.

Gap Analysis with Static Supply: In this section, the analysis assumed the number of maternity care service providers in each county would remain constant at their 2018 values. Using this constant numerator, Table 8 gives the calculated ratios of maternity care providers per 10,000 women of childbearing age in each rural county, projected out to 2025. Any changes in

these ratios over time come from projected changes in the county populations of females ages 15 to 44. This subset of the rural population has been declining somewhat significantly for the past couple of decades and is projected to continue to fall. Hence the total growth in the ratio for ALL RURAL from 2018 to 2025 in the top line of the table.

Table 8: 2018 to 2025 Projected Number of Maternity Care Service Providers per 10,000 Females, Ages 15 to 44. All provider counts held constant at 2018 values.

	2018	2019	2020	2021	2022	2023	2024	2025	Projected Change 2018-2025
ALL RURAL	24.53	24.68	24.98	25.26	25.56	25.86	26.17	26.48	1.95
Adams	20.03	19.99	20.14	20.29	20.44	20.59	20.74	20.90	0.87
Allegheny	36.51	36.50	36.69	36.88	37.06	37.26	37.45	37.64	1.13
Armstrong	17.65	17.85	18.15	18.42	18.69	18.98	19.27	19.57	1.92
Beaver	24.95	24.91	26.29	26.78	27.29	27.82	28.37	28.95	4.00
Bedford	14.83	14.98	15.28	15.56	15.85	16.14	16.45	16.77	1.94
Berks	25.05	25.00	25.00	25.00	25.00	25.00	25.00	25.01	-0.05
Blair	41.92	42.03	42.66	43.25	43.85	44.48	45.12	45.78	3.86
Bradford	43.35	43.97	44.72	45.48	46.27	47.09	47.93	48.81	5.46
Bucks	26.43	26.44	26.97	27.26	27.55	27.84	28.15	28.45	2.02
Butler	21.55	21.55	22.24	22.46	22.70	22.93	23.18	23.42	1.87
Cambria	44.73	45.58	46.55	47.48	48.44	49.45	50.50	51.59	6.87
Cameron	33.78	34.36	36.20	37.89	39.75	41.80	44.07	46.60	12.82
Carbon	18.82	18.67	18.83	19.00	19.16	19.34	19.51	19.69	0.87
Centre	22.85	23.04	22.99	22.94	22.89	22.85	22.80	22.75	-0.10
Chester	29.59	29.37	29.39	29.38	29.37	29.37	29.36	29.36	-0.23
Clarion	15.93	16.30	16.66	16.96	17.26	17.57	17.90	18.24	2.31
Clearfield	24.25	24.45	25.29	25.79	26.32	26.86	27.43	28.03	3.78
Clinton	15.73	15.70	15.73	15.76	15.79	15.81	15.84	15.87	0.14
Columbia	18.93	19.08	19.43	19.71	19.99	20.28	20.58	20.90	1.97
Crawford	29.55	29.91	30.38	30.84	31.32	31.82	32.33	32.86	3.31
Cumberland	29.02	28.83	29.13	29.11	29.09	29.08	29.06	29.05	0.03
Dauphin	40.36	40.08	40.17	40.17	40.17	40.16	40.16	40.16	-0.20
Delaware	23.59	23.42	23.81	23.89	23.96	24.03	24.10	24.18	0.59
Elk	24.44	24.73	26.45	27.29	28.19	29.15	30.18	31.28	6.84
Erie	37.79	38.31	38.83	39.39	39.96	40.56	41.17	41.80	4.00
Fayette	16.50	16.70	17.38	17.77	18.18	18.61	19.07	19.54	3.04
Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Franklin	28.15	28.17	28.20	28.24	28.27	28.31	28.34	28.38	0.23
Fulton	4.27	4.26	4.32	4.38	4.43	4.49	4.55	4.61	0.34
Greene	21.40	21.85	22.25	22.68	23.11	23.57	24.05	24.54	3.14

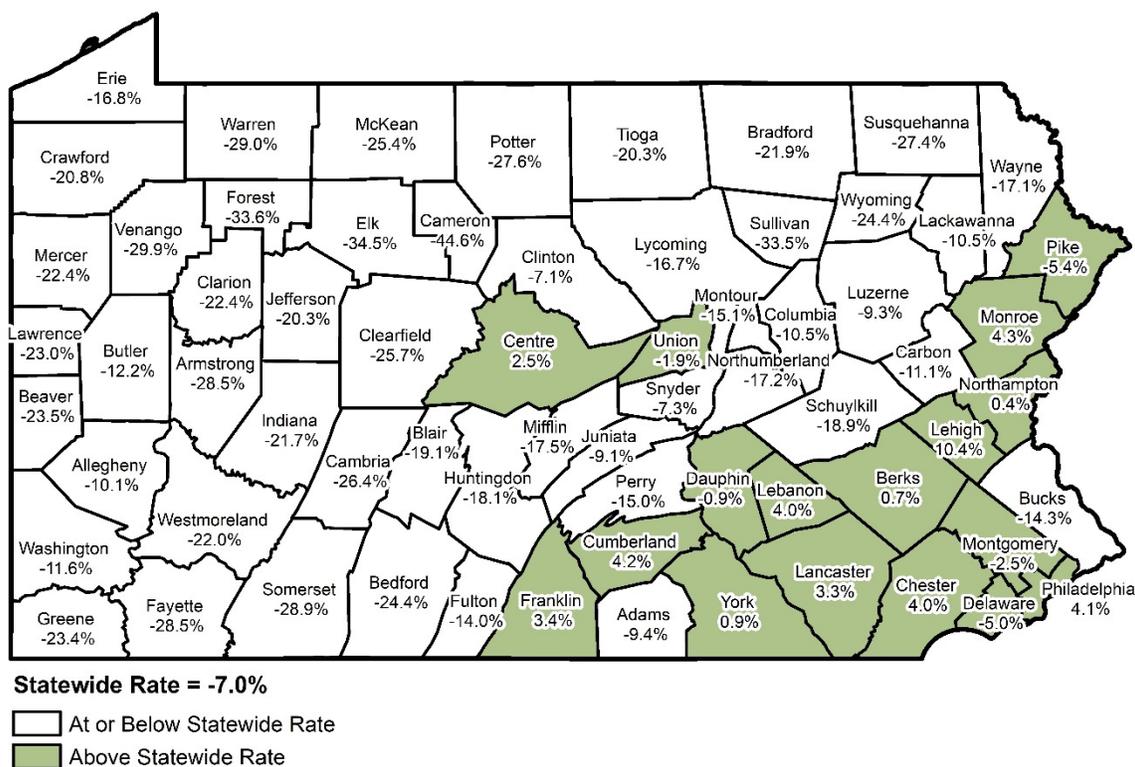
Huntingdon	16.87	17.00	17.31	17.53	17.76	17.99	18.23	18.48	1.61
Indiana	18.46	18.49	18.79	19.09	19.41	19.74	20.08	20.43	1.97
Jefferson	23.95	24.07	24.66	25.06	25.47	25.89	26.33	26.79	2.83
Juniata	9.70	9.79	9.85	9.90	9.95	10.01	10.06	10.11	0.41
Lackawanna	16.81	16.92	17.02	17.12	17.23	17.34	17.44	17.55	0.75
Lancaster	35.93	35.87	35.87	35.81	35.76	35.71	35.66	35.61	-0.32
Lawrence	18.30	18.43	18.89	19.22	19.57	19.92	20.30	20.68	2.38
Lebanon	30.71	30.72	30.75	30.69	30.64	30.58	30.52	30.46	-0.24
Lehigh	42.46	42.41	42.16	41.91	41.67	41.43	41.19	40.95	-1.51
Luzerne	29.41	29.44	29.71	29.85	29.99	30.13	30.27	30.41	1.00
Lycoming	41.52	41.42	42.69	43.19	43.71	44.25	44.80	45.36	3.84
McKean	21.00	21.24	21.61	21.99	22.37	22.77	23.18	23.60	2.60
Mercer	21.74	22.02	22.40	22.77	23.14	23.53	23.93	24.35	2.61
Mifflin	41.65	42.08	42.87	43.41	43.95	44.52	45.09	45.68	4.03
Monroe	11.30	11.29	11.31	11.33	11.35	11.36	11.38	11.40	0.10
Montgomery	39.52	39.31	39.24	39.18	39.11	39.05	38.98	38.91	-0.61
Montour	160.21	161.60	166.15	167.81	169.50	171.23	172.99	174.79	14.58
Northampton	28.15	28.09	28.13	28.16	28.19	28.22	28.24	28.27	0.12
Northumberland	18.55	18.58	18.78	18.96	19.16	19.35	19.55	19.75	1.20
Perry	11.70	11.70	11.85	11.99	12.13	12.28	12.42	12.57	0.87
Philadelphia	22.88	22.84	22.65	22.53	22.42	22.30	22.19	22.08	-0.80
Pike	8.35	8.45	8.57	8.69	8.82	8.95	9.08	9.22	0.87
Potter	20.19	20.33	21.20	21.76	22.35	22.97	23.63	24.32	4.13
Schuylkill	17.16	17.14	17.43	17.63	17.83	18.04	18.25	18.47	1.31
Snyder	18.53	18.73	18.84	18.96	19.09	19.22	19.35	19.48	0.95
Somerset	18.63	18.95	19.44	19.90	20.37	20.87	21.39	21.93	3.30
Sullivan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Susquehanna	15.35	15.32	15.71	16.08	16.47	16.87	17.30	17.75	2.40
Tioga	20.18	20.43	20.38	20.66	20.96	21.26	21.58	21.90	1.72
Union	38.48	38.52	38.82	38.89	38.95	39.01	39.07	39.14	0.66
Venango	17.78	18.13	18.68	19.13	19.60	20.09	20.62	21.17	3.39
Warren	23.49	23.88	25.03	25.62	26.23	26.87	27.54	28.25	4.76
Washington	34.72	34.84	35.34	35.65	35.97	36.30	36.63	36.96	2.24
Wayne	15.44	15.52	15.71	15.89	16.07	16.26	16.46	16.66	1.22
Westmoreland	32.32	32.49	33.58	34.16	34.76	35.38	36.02	36.69	4.37
Wyoming	22.54	23.07	23.50	23.95	24.42	24.90	25.41	25.94	3.40
York	31.35	31.30	-0.05						

In general, rural counties are experiencing declines in this population subset as indicated in Figure 12, which shows the percent changes in the population of females ages 15 to 44 within each county from 2000 to 2019. Previous sections looked at the statewide numbers only. This

figure shows that only 12 of the 67 counties experienced population growth for this subset over this 19-year period. Of these, three urban counties grew by less than 1.0 percent and only one county grew this population subset by more than 10.0 percent. The remaining counties all saw growth between 2.5 and 4.5 percent over the 19-year period. The only rural counties experiencing growth in this subset of the population were Centre, Franklin and Monroe, at 2.51, 3.38, and 4.31 percent, respectively.

Despite these gains, the provider ratios in each of these counties are expected to essentially stay constant at their 2018 equilibrium levels through 2025. Cameron County experienced the greatest decline, with the number of females ages 15 to 44 falling by 44.57 percent over that period. (This is outside the lower bounds for the mapping, so Cameron County is not shaded in.) Forest, Elk, and Sullivan counties each saw declines of between 30 and 40 percent, while 21 counties had this population subset decrease by 20 to 30 percent from their 2000 numbers. Another 12 had declines of between 10 and 20 percent, while six experienced smaller declines. Union County had the smallest decline overall of 1.85 percent.

Figure 12: Percent Change in Population of Females, Ages 15-44, from 2000 to 2019



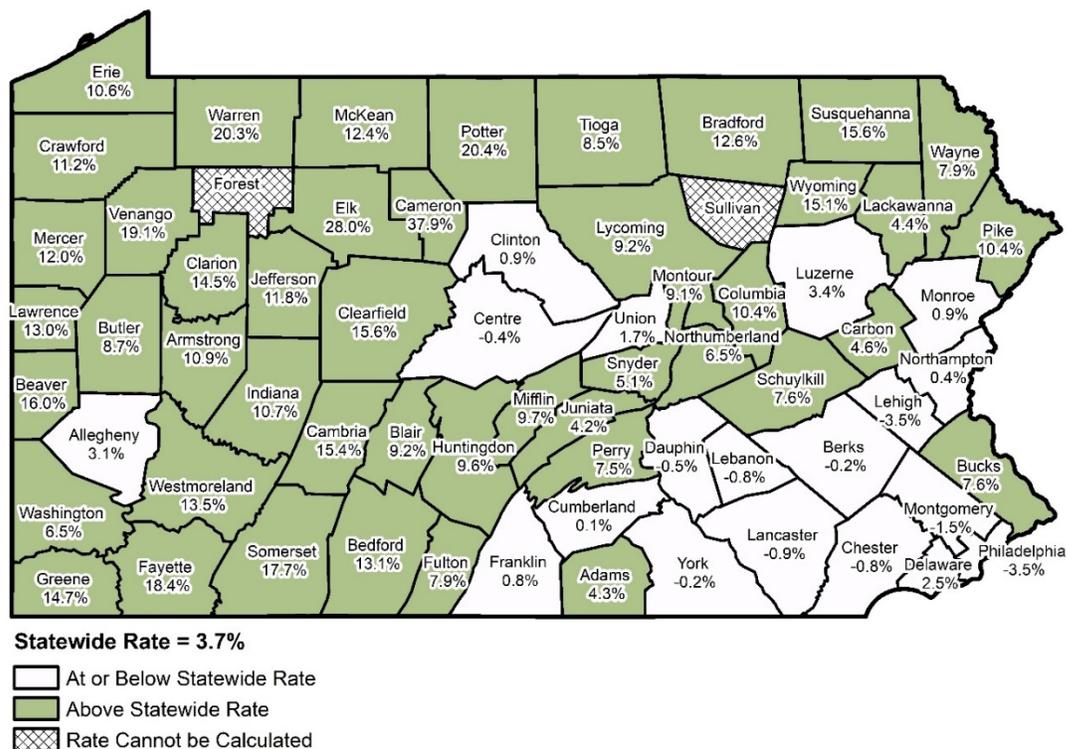
Data source: Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE).

Only Centre County has a projected decrease in its ratio of maternity care service providers per 2,500 women of childbearing age, and the decrease is very slight, at -0.02 percent. As mentioned above, this population in Centre County is forecast to expand, but only very slightly, through 2025. Looking at the table, its provider ratios are essentially unchanged throughout, which indicates that equilibrium between supply and demand is projected to be maintained through 2025 in Centre County. Several other counties also have only fairly minimal changes in this population subset over the projection period. Hence, changes in provider ratios that are smaller than 0.50 reflect maintenance of the 2018 equilibrium conditions between demand and supply. This can be verified by looking at the associated county's row of these ratios to see that they change little over the course of the projections.

Forest and Sullivan counties are projected to continue to have no service providers of these types, while the remaining 45 counties all see gains. However, 21 of these counties have gains in the values of their provider ratios of less than 0.50, with the changes for Clinton, Franklin, Fulton, Juniata, and Monroe counties all being 0.10 or less. Like Centre County, these 21 counties can therefore be viewed as being projected to essentially maintain their 2018 equilibriums going forward.

Sixteen rural counties are projected to see gains in their provider ratios of between 0.50 and 1.00, indicating perhaps slight improvement in the number of maternity care service providers per 2,500 women of childbearing age through 2025. Four counties – Bradford, Mifflin, Potter, and Warren – are projected to have moderate gains. Cambria and Elk counties are projected to do even better, with increases of 1.72 and 1.71, respectively. Cameron and Montour counties are expected to see the greatest increases, with the number of maternity care service providers per 2,500 women of childbearing age projected to rise 3.20 and 3.65, respectively.

Figure 13: Projected Percent Change from 2018 to 2025 in Number of Maternity Care Service Providers per 10,000 Females, Ages 15 to 44. All provider counts held constant at 2018 values.



To summarize, according to these projections based on static supply, rural Pennsylvania counties will maintain their recent levels of providers per 2,500 women of childbearing age through 2025, and many counties are projected to see increases in these services. Of course, this increase is solely due to expected population changes in these counties.

One important caveat to this analysis is that it does not consider retirement of practitioners through 2025. Another important caveat is that the status quo in 2018 in some counties falls within the category of “maternity care desert” as identified by March of Dimes (2020). Because not all family physicians attend births, it is instructive to examine the projected number of OB/GYNs and CNMs, providers who specialize in attending births, as done by the March of Dimes (2020). Focusing on these two professions, Table 9 shows that 18 rural counties will remain or become maternity care deserts by 2025.

Table 9: 2018 to 2025 Projected Number of OB/GYN and Certified Nurse Midwives per 10,000 Births. All provider counts held constant at 2018 values.

	2018	2019	2020	2021	2022	2023	2024	2025	Projected Change 2018-2025
All Rural Counties	436.95	438.93	441.79	444.69	447.62	450.60	453.62	456.67	19.73
Adams	374.73	370.27	375.14	380.13	385.27	390.54	395.96	401.53	26.80
Allegheny	672.00	674.69	677.39	680.12	682.87	685.64	688.43	691.25	19.25
Armstrong	321.43	322.87	327.65	332.58	337.66	342.90	348.30	353.88	32.45
Beaver	429.29	428.27	431.08	433.92	436.81	439.73	442.69	445.70	16.40
Bedford	235.04	245.13	248.36	251.68	255.08	258.58	262.17	265.87	30.82
Berks	425.35	425.32	425.30	425.28	425.26	425.23	425.21	425.19	-0.16
Blair	727.27	708.88	716.37	724.03	731.85	739.84	748.00	756.35	29.08
Bradford	625.00	607.42	610.54	613.69	616.87	620.09	623.33	626.62	1.62
Bucks	498.95	530.44	540.20	550.32	560.83	571.74	583.10	594.91	95.96
Butler	392.38	412.71	418.13	423.69	429.41	435.28	441.31	447.52	55.14
Cambria	802.32	785.65	796.02	806.67	817.61	828.85	840.40	852.28	49.97
Cameron	540.54	521.38	534.96	549.26	564.35	580.30	597.17	615.05	74.51
Carbon	347.35	345.94	347.01	348.09	349.17	350.26	351.35	352.45	5.11
Centre	724.64	690.60	691.90	693.21	694.52	695.83	697.15	698.48	-26.16
Chester	528.08	532.58	536.24	539.95	543.72	547.53	551.40	555.33	27.25
Clarion	324.32	309.98	310.91	311.85	312.79	313.74	314.69	315.65	-8.67
Clearfield	414.29	405.70	409.17	412.69	416.28	419.93	423.65	427.43	13.14
Clinton	286.40	292.08	292.57	293.07	293.57	294.07	294.58	295.08	8.69
Columbia	478.93	494.10	522.04	553.32	588.59	628.66	674.59	727.76	248.83
Crawford	481.93	484.18	489.16	494.24	499.42	504.72	510.13	515.65	33.72
Cumberland	523.48	517.66	512.83	508.08	503.42	498.84	494.35	489.93	-33.55
Dauphin	623.16	620.13	617.13	614.16	611.21	608.30	605.41	602.54	-20.62
Delaware	403.40	397.15	398.11	399.07	400.03	401.00	401.98	402.96	-0.45
Elk	418.25	418.90	426.76	434.93	443.42	452.24	461.42	470.99	52.74
Erie	685.82	639.43	645.20	651.07	657.05	663.14	669.35	675.67	-10.15
Fayette	269.02	271.50	274.01	276.58	279.19	281.85	284.57	287.34	18.31
Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Franklin	439.81	437.77	435.75	433.75	431.76	429.79	427.84	425.91	-13.91
Fulton	70.92	71.71	72.51	73.33	74.17	75.04	75.92	76.82	5.90
Greene	388.06	351.72	353.74	355.79	357.86	359.96	362.08	364.23	-23.83
Huntingdon	287.77	294.49	298.02	301.64	305.34	309.14	313.03	317.02	29.25
Indiana	370.83	365.38	367.26	369.17	371.09	373.04	375.00	376.99	6.16
Jefferson	356.39	357.89	358.84	359.78	360.74	361.69	362.66	363.62	7.23
Juniata	136.52	147.59	148.20	148.82	149.45	150.08	150.71	151.36	14.84
Lackawanna	315.74	316.07	316.41	316.75	317.08	317.42	317.76	318.10	2.36
Lancaster	526.32	522.60	521.00	519.41	517.82	516.25	514.69	513.13	-13.18

Lawrence	295.79	295.64	297.65	299.70	301.77	303.88	306.01	308.17	12.38
Lebanon	495.18	495.49	499.97	504.53	509.17	513.89	518.71	523.61	28.44
Lehigh	690.29	687.62	683.81	680.05	676.33	672.65	669.01	665.41	-24.88
Luzerne	491.41	489.76	487.87	485.99	484.13	482.28	480.44	478.62	-12.79
Lycoming	702.48	706.21	710.36	714.56	718.81	723.11	727.46	731.87	29.39
McKean	383.56	373.25	380.52	388.07	395.93	404.12	412.65	421.55	37.99
Mercer	376.65	375.71	379.96	384.30	388.74	393.29	397.94	402.71	26.06
Mifflin	508.20	538.74	539.80	540.87	541.95	543.03	544.11	545.20	37.00
Monroe	230.11	230.52	230.92	231.33	231.74	232.14	232.55	232.96	2.85
Montgomery	703.91	707.35	713.36	719.48	725.70	732.03	738.48	745.03	41.12
Montour	2538.07	2402.55	2404.97	2407.40	2409.84	2412.27	2414.72	2417.16	-120.91
Northampton	540.73	544.08	545.56	547.05	548.55	550.06	551.58	553.11	12.38
Northumberland	301.68	286.03	286.98	287.94	288.91	289.88	290.86	291.85	-9.82
Perry	177.87	167.96	167.90	167.84	167.78	167.71	167.65	167.59	-10.27
Philadelphia	404.76	412.60	422.41	432.70	443.51	454.87	466.82	479.42	74.66
Pike	169.49	169.48	169.34	169.19	169.04	168.89	168.74	168.60	-0.90
Potter	297.62	293.31	297.84	302.51	307.33	312.30	317.44	322.75	25.13
Schuylkill	298.04	296.80	298.50	300.23	301.98	303.75	305.53	307.34	9.30
Snyder	324.07	314.90	315.15	315.40	315.65	315.90	316.15	316.40	-7.68
Somerset	271.00	273.48	276.00	278.57	281.18	283.85	286.57	289.33	18.33
Sullivan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Susquehanna	231.96	252.28	255.52	258.84	262.25	265.75	269.35	273.05	41.09
Tioga	355.33	355.49	355.64	355.80	355.96	356.11	356.27	356.43	1.10
Union	748.13	746.86	746.07	745.28	744.50	743.71	742.93	742.15	-5.98
Venango	297.24	301.14	305.51	310.00	314.63	319.40	324.31	329.38	32.14
Warren	335.73	337.81	339.91	342.04	344.20	346.39	348.60	350.84	15.11
Washington	604.86	623.38	625.45	627.55	629.65	631.77	633.91	636.05	31.20
Wayne	277.78	290.24	294.98	299.87	304.92	310.15	315.57	321.17	43.39
Westmoreland	614.28	603.51	609.86	616.36	622.99	629.77	636.69	643.77	29.50
Wyoming	416.67	379.63	384.37	389.22	394.20	399.31	404.56	409.94	-6.73
York	537.04	535.52	534.00	532.49	530.99	529.50	528.02	526.54	-10.50

Gap Analysis with Projected Growth in Provider Numbers: The projected provider growth rates are shown in Table 10 and are only available at the state level. Note that there is no expected growth for the number of OB/GYN practitioners in the state as a whole, while the number of Family Practice physicians in Pennsylvania is expected to increase 8.3 percent between 2018 and 2028, and the numbers of Certified Nurse Midwives are projected to increase 9.10 percent. One caveat in the use of these statewide projections is that growth in medical

profession employment in rural counties tends to lag significantly behind urban counties, as do the proportionate number of providers in rural practice. With the downward rural population trends seen above, this is certain to be the case in Pennsylvania. Because of these trends, the following results provide potential upper bounds for the projected provider ratio outcomes.

Table 10: Pennsylvania Employment and Projected Growth in Employment for Selected Specialties

	Projected growth 2018-2028	Annualized Average Compound Growth Rate
Obstetricians and Gynecologists	0.00%	0.00%
Family Medicine Physicians*	8.30%	0.80%
Certified Nurse Midwives	9.10%	0.87%

*Based on Employment data for Family and General Practitioners.

Source: Projections Central. The annualized average growth rates were calculated by the authors.

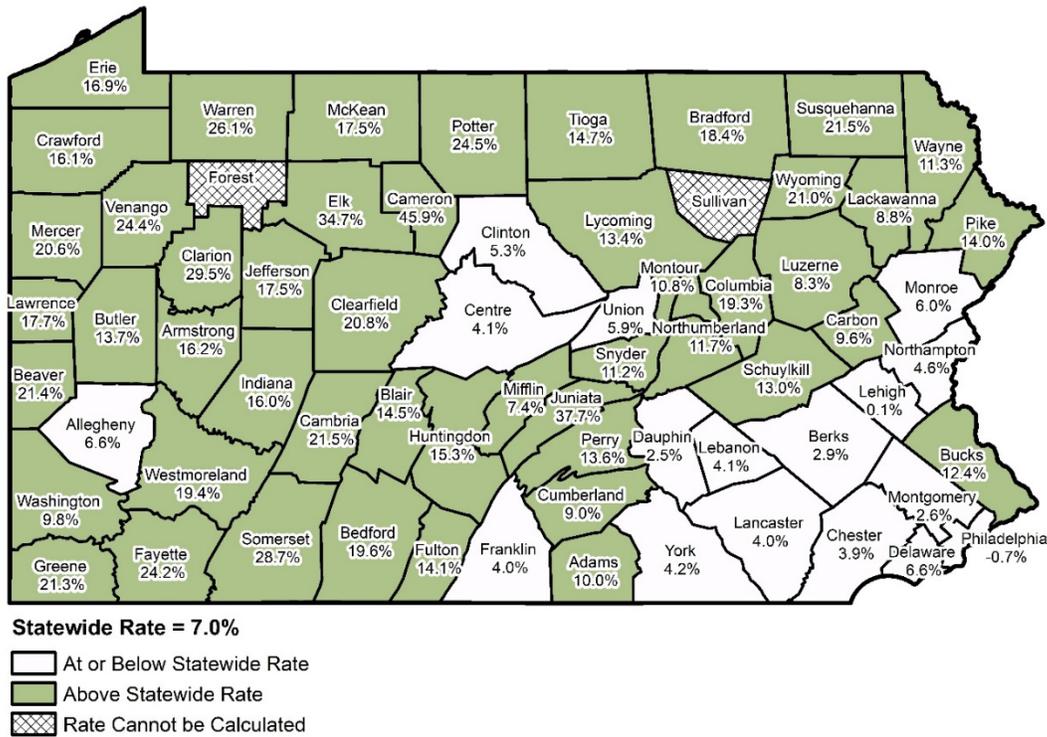
Table 11 and Figure 14 provide the projected supply of OB/GYN, Family Practice and Certified Nurse Midwife maternity care service providers per 2,500 females ages 15 to 44, along with the projected change in the ratio over the 2018 to 2025 period. The provider counts in the numerator of the ratio calculations were grown annually at the annualized average compound growth rates given in Table 10. There is no growth in the number of OB/GYN practitioners over the forecast period. In comparison to the previous analysis, all counties, except Forest and Sullivan, will see higher projected growth in their ratios now, meaning an even greater increase in relative supply of providers is projected for most. This trend occurs because not only are the population subsets in the denominator declining for all but three of the counties, now the number of providers in the numerator is projected to grow, whereas before these were held constant in each ratio calculation. The result is that we now see only 10 counties that are projected to maintain their 2018 equilibriums by the above criteria, with the rest projected to see increases in the number of providers relative to demand.

Table 11: 2018 to 2025 Projected Number of Potential Maternity Care Service Providers per 10,000 Females, Ages 15 to 44, with Annual Growth in Provider Supply.

	2018	2019	2020	2021	2022	2023	2024	2025	Projected Change 2018-2025
ALL RURAL	24.53	24.80	25.27	25.73	26.20	26.69	27.19	27.71	3.18
Adams	20.03	20.12	20.43	20.73	21.05	21.37	21.69	22.02	1.99
Allegheny	36.51	36.52	36.91	37.30	37.70	38.11	38.52	38.93	2.42
Armstrong	17.65	17.97	18.39	18.79	19.20	19.62	20.05	20.51	2.85
Beaver	24.95	25.07	26.63	27.31	28.01	28.74	29.50	30.29	5.34
Bedford	14.83	15.09	15.52	15.93	16.35	16.79	17.25	17.73	2.90
Berks	25.05	24.87	25.02	25.17	25.32	25.47	25.62	25.78	0.72
Blair	41.92	42.31	43.23	44.13	45.06	46.01	47.00	48.01	6.09
Bradford	43.35	44.26	45.35	46.46	47.61	48.80	50.04	51.33	7.98
Bucks	26.43	26.59	27.30	27.76	28.23	28.71	29.21	29.71	3.28
Butler	21.55	21.69	22.51	22.89	23.28	23.67	24.08	24.50	2.95
Cambria	44.73	45.89	47.23	48.53	49.89	51.32	52.80	54.36	9.63
Cameron	33.78	34.64	36.78	38.81	41.04	43.50	46.23	49.27	15.49
Carbon	18.82	18.78	19.07	19.37	19.68	19.99	20.31	20.63	1.81
Centre	22.85	23.18	23.28	23.38	23.49	23.59	23.69	23.79	0.94
Chester	29.59	29.65	29.84	30.02	30.19	30.37	30.55	30.73	1.15
Clarion	15.93	17.74	18.26	18.69	19.15	19.62	20.11	20.62	4.69
Clearfield	24.25	24.58	25.59	26.27	26.98	27.72	28.49	29.29	5.05
Clinton	15.73	15.79	15.92	16.04	16.17	16.30	16.42	16.55	0.83
Columbia	18.93	19.95	20.43	20.83	21.25	21.68	22.13	22.59	3.66
Crawford	29.55	30.09	30.75	31.41	32.10	32.82	33.55	34.31	4.77
Cumberland	29.02	30.26	30.76	30.93	31.11	31.28	31.46	31.64	2.62
Dauphin	40.36	39.92	40.23	40.46	40.68	40.91	41.14	41.37	1.01
Delaware	23.59	23.55	24.08	24.29	24.50	24.71	24.93	25.15	1.56
Elk	24.44	24.91	26.83	27.89	29.02	30.23	31.52	32.91	8.47
Erie	37.79	38.78	39.59	40.46	41.35	42.27	43.22	44.20	6.40
Fayette	16.50	16.82	17.62	18.14	18.69	19.26	19.86	20.50	4.00
Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Franklin	28.15	27.96	28.17	28.39	28.61	28.83	29.05	29.28	1.13
Fulton	4.27	4.30	4.39	4.48	4.58	4.67	4.77	4.87	0.60
Greene	21.40	22.03	22.61	23.22	23.86	24.53	25.22	25.95	4.55
Huntingdon	16.87	17.13	17.56	17.92	18.29	18.66	19.05	19.45	2.59
Indiana	18.46	18.61	19.04	19.48	19.93	20.41	20.90	21.40	2.94
Jefferson	23.95	24.23	25.00	25.58	26.19	26.81	27.46	28.14	4.18
Juniata	9.70	12.32	12.49	12.66	12.83	13.00	13.18	13.36	3.66
Lackawanna	16.81	17.01	17.21	17.42	17.63	17.84	18.06	18.28	1.47
Lancaster	35.93	36.10	36.35	36.55	36.75	36.95	37.15	37.36	1.43
Lawrence	18.30	18.54	19.11	19.56	20.03	20.52	21.02	21.55	3.25

Lebanon	30.71	30.93	31.17	31.33	31.49	31.64	31.80	31.96	1.25
Lehigh	42.46	42.62	42.60	42.58	42.55	42.53	42.51	42.50	0.04
Luzerne	29.41	29.63	30.10	30.44	30.79	31.14	31.49	31.85	2.44
Lycoming	41.52	41.18	42.74	43.56	44.40	45.26	46.15	47.07	5.55
McKean	21.00	21.37	21.89	22.40	22.94	23.49	24.07	24.67	3.67
Mercer	21.74	22.72	23.28	23.83	24.39	24.98	25.58	26.21	4.47
Mifflin	41.65	39.55	40.57	41.36	42.16	42.99	43.85	44.73	3.08
Monroe	11.30	11.36	11.46	11.56	11.66	11.77	11.87	11.98	0.68
Montgomery	39.52	39.64	39.79	39.94	40.09	40.24	40.39	40.54	1.02
Montour	160.21	159.04	164.36	166.86	169.42	172.03	174.71	177.44	17.24
Northampton	28.15	28.25	28.45	28.65	28.84	29.04	29.24	29.44	1.29
Northumberland	18.55	18.71	19.03	19.36	19.68	20.02	20.37	20.72	2.16
Perry	11.70	11.80	12.04	12.28	12.52	12.77	13.03	13.30	1.59
Philadelphia	22.88	22.85	22.76	22.75	22.74	22.73	22.72	22.72	-0.16
Pike	8.35	8.49	8.65	8.81	8.98	9.16	9.34	9.52	1.17
Potter	20.19	20.39	21.37	22.04	22.75	23.50	24.30	25.14	4.95
Schuylkill	17.16	17.26	17.67	18.00	18.33	18.67	19.02	19.39	2.23
Snyder	18.53	18.88	19.14	19.42	19.71	20.00	20.30	20.60	2.07
Somerset	18.63	20.00	20.64	21.25	21.88	22.54	23.24	23.97	5.34
Sullivan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Susquehanna	15.35	15.43	15.94	16.43	16.94	17.48	18.05	18.65	3.31
Tioga	20.18	20.59	20.71	21.17	21.64	22.13	22.63	23.16	2.97
Union	38.48	38.69	39.22	39.52	39.83	40.13	40.44	40.75	2.28
Venango	17.78	18.25	18.91	19.49	20.10	20.74	21.41	22.12	4.34
Warren	23.49	24.01	25.34	26.11	26.92	27.78	28.68	29.62	6.13
Washington	34.72	34.50	35.23	35.78	36.35	36.92	37.51	38.11	3.39
Wayne	15.44	15.59	15.85	16.10	16.36	16.63	16.90	17.18	1.74
Westmoreland	32.32	32.73	34.07	34.90	35.77	36.68	37.62	38.59	6.27
Wyoming	22.54	23.24	23.84	24.47	25.13	25.82	26.53	27.28	4.74
York	31.35	31.37	31.58	31.79	32.00	32.22	32.44	32.65	1.30

Figure 14: Projected Percent Change from 2018 to 2025 in Number of Maternity Care Service Providers per 10,000 Females, Ages 15 to 44 given projected annualized growth rates of providers.



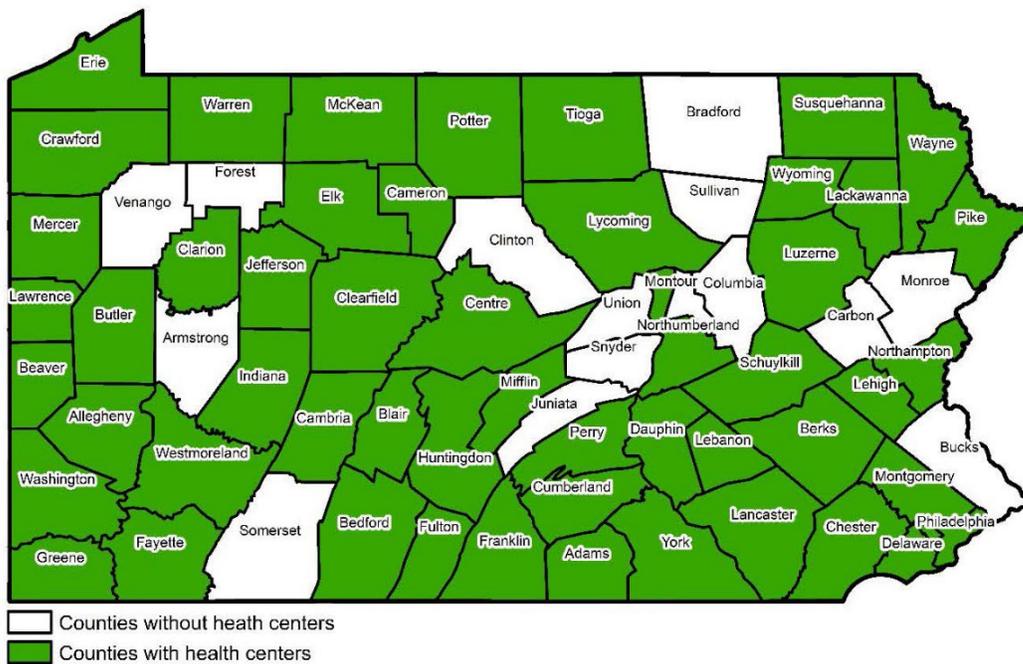
These data indicate that 17 counties are expected to see small gains in their provider ratios of between 0.50 and 1.00 per 2,500 women of childbearing age through the projection period. Nine counties will potentially see gains of between 1.00 and 1.50, while there are four with moderate gains of 1.50 to 2.00. The remaining five counties – Bradford, Cambria, Cameron, Elk, and Montour – are projected to see relatively strong gains of 2.00, 2.42, 3.87, 2.12, and 5.28, respectively.

Goal 2: Health Outcomes and Facilities

Health Facilities: As of April 2021, Pennsylvania had 16 critical access hospitals, 70 rural health clinics, and 99 federally qualified health center sites located outside of urban areas, and 35 short-term hospitals located outside of urban areas (Rural Health Information Hub, 2021).

When no private practitioners are available or accessible, or when those who are available do not accept a person’s insurance, federally qualified health centers (FQHCs) fill the gap. FQHCs are community-based health care providers that receive funds from the HRSA Health Center Program to provide primary care services in underserved areas (HRSA, 2021). According to the Pennsylvania Association of Community Health Centers (2020), community health centers are in 52 Pennsylvania counties, and serve one in four Pennsylvanians.

Figure 15: Location of Pennsylvania Community Health Centers



Map courtesy of Pennsylvania Association of Community Health Centers.

In 2020, about 96 percent of births in Pennsylvania occurred in hospitals, while 2.2 percent occurred at home, and 1.3 percent occurred in freestanding birthing centers (EDDIE). Slightly more than 0.5 percent occurred in other locations, which includes precipitous births on the way to the hospital or birth center.

Because hospitals are the most common location for births, an examination of available perinatal hospital services can illustrate patterns of access to care. Specialty care services for

women and newborns are not evenly distributed across the state (Pennsylvania Department of Health, 2020).

In the following analysis, licensed beds are those beds licensed by the Pennsylvania Department of Health regardless of whether those beds are actually in use. Beds that are set up and staffed are those regularly maintained and available for patients based on staffing during the reporting period.

Neonatal Intensive Care Units (NICUs) are special nurseries that provide continuous around-the-clock care for babies that are born sick or premature. NICUs require specialized providers with advanced skills and are generally found in population centers. As shown in Figure 16, 31 rural counties have no NICUs, which means that infants with complications must be transported to the closest regional hospital with NICU services. Six rural counties have no hospitals at all.

Figure 16. Licensed Beds, Neonatal Intensive Care

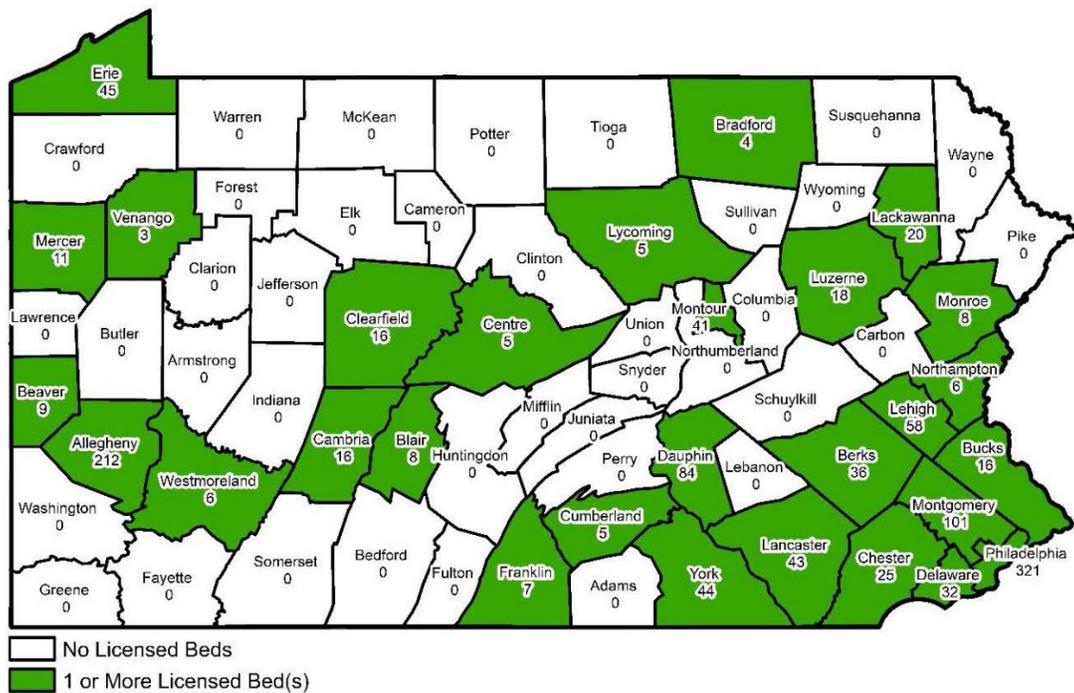


Table 12. Licensed Beds, Neonatal

County	Licensed Beds	County	Licensed Beds	County	Licensed Beds
Adams	0	Elk	0	Montgomery	101
Allegheny	212	Erie	45	Montour	41
Armstrong	0	Fayette	0	Northampton	6
Beaver	9	Forest	0	Northumberland	0
Bedford	0	Franklin	7	Perry	0
Berks	36	Fulton	0	Philadelphia	321
Blair	8	Greene	0	Pike	0
Bradford	4	Huntingdon	0	Potter	0
Bucks	16	Indiana	0	Schuylkill	0
Butler	0	Jefferson	0	Snyder	0
Cambria	16	Juniata	0	Somerset	0
Cameron	0	Lackawanna	20	Sullivan	0
Carbon	0	Lancaster	43	Susquehanna	0
Centre	5	Lawrence	0	Tioga	0
Chester	25	Lebanon	0	Union	0
Clarion	0	Lehigh	58	Venango	3
Clearfield	16	Luzerne	18	Warren	0
Clinton	0	Lycoming	5	Washington	0
Columbia	0	McKean	0	Wayne	0
Crawford	0	Mercer	11	Westmoreland	6
Cumberland	5	Mifflin	0	Wyoming	0
Dauphin	84	Monroe	8	York	44
Delaware	32				

Hospitals may have beds that are reserved for labor and delivery (OB) and/or beds that are used for both obstetrics and gynecology services (OB/GYN). As shown in Figure 17 and Table 13, 19 rural counties do not have hospitals with obstetrics facilities. Women who live in these counties must travel to the closest hospital with obstetric services when in labor. As noted earlier, no accredited freestanding birth centers are located in rural counties.

Table 13. Licensed Beds, OB+OB/GYN

County	Licensed Beds	County	Licensed Beds	County	Licensed Beds
Adams	12	Elk	4	Montgomery	218
Allegheny	300	Erie	70	Montour	25
Armstrong	17	Fayette	0	Northampton	9
Beaver	30	Forest	0	Northumberland	0
Bedford	0	Franklin	39	Perry	0
Berks	75	Fulton	0	Philadelphia	272
Blair	32	Greene	0	Pike	0
Bradford	12	Huntingdon	0	Potter	7
Bucks	90	Indiana	17	Schuylkill	9
Butler	33	Jefferson	9	Snyder	0
Cambria	24	Juniata	0	Somerset	13
Cameron	0	Lackawanna	53	Sullivan	0
Carbon	0	Lancaster	94	Susquehanna	0
Centre	11	Lawrence	0	Tioga	3
Chester	93	Lebanon	14	Union	16
Clarion	13	Lehigh	136	Venango	10
Clearfield	18	Luzerne	68	Warren	10
Clinton	0	Lycoming	17	Washington	17
Columbia	14	McKean	9	Wayne	11
Crawford	10	Mercer	56	Westmoreland	23
Cumberland	42	Mifflin	12	Wyoming	0
Dauphin	66	Monroe	20	York	69
Delaware	58				

Data source: Pennsylvania Department of Health, Health Facilities Data.

As noted earlier, the number of licensed beds provides incomplete data because the actual number of beds prepared and staffed for patient use may be lower. Table 14 compares the number of licensed beds in a county to the number of beds set up and staffed. Generally, the difference between licensed beds and set-up, and staffed beds affects urban counties.

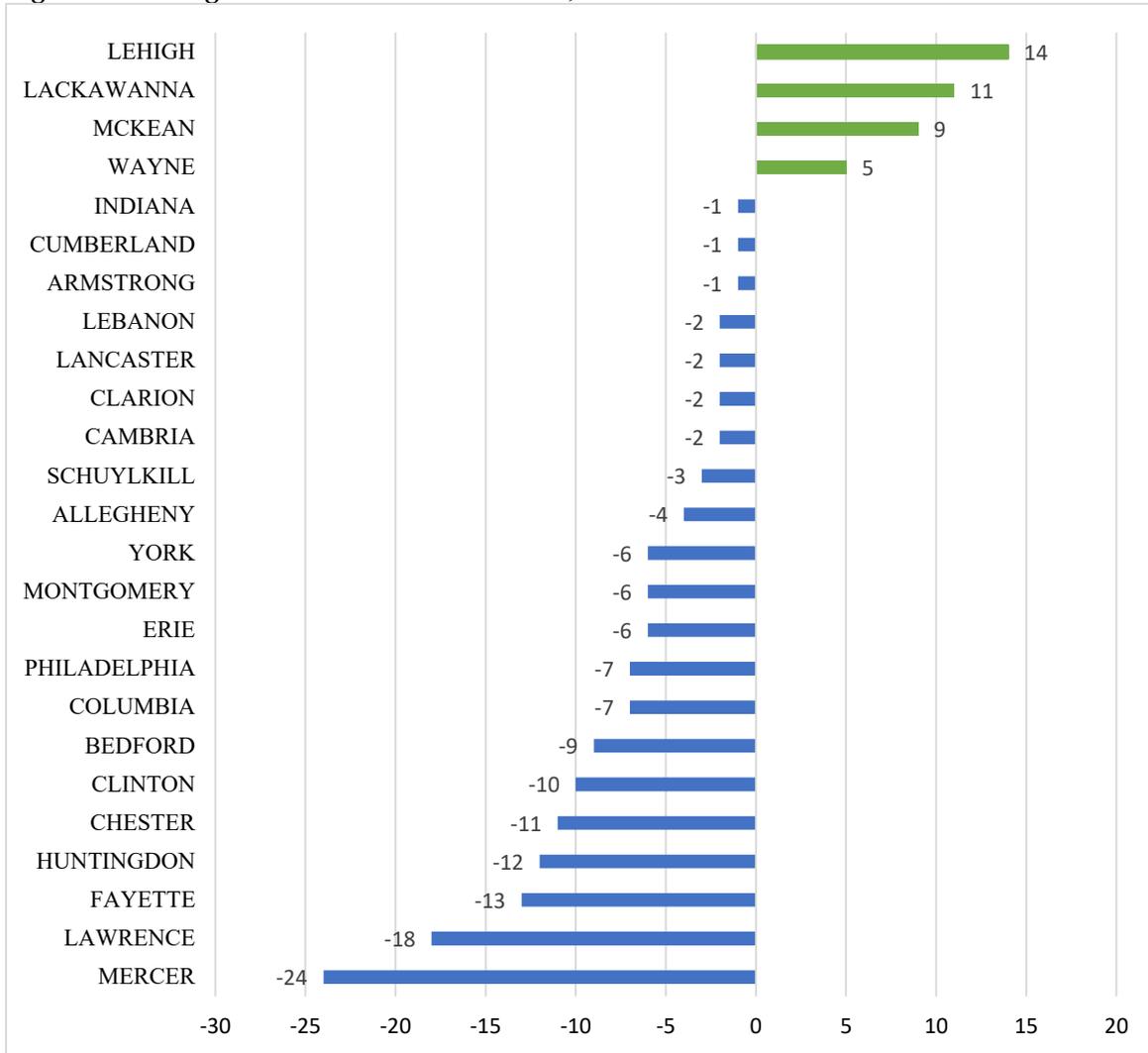
Table 14. Licensed Beds vs Beds Set-up and Staffed, OB+OB/GYN

County	Total OB + OB/GYN Licensed Beds	Total OB + OB/GYN Beds Set-up and Staffed	County	Total OB + OB/GYN Licensed Beds	Total OB + OB/GYN Beds Set-up and Staffed
Adams	12	12	Jefferson	9	6
Allegheny	300	239	Lackawanna	53	53
Armstrong	17	17	Lancaster	94	88
Beaver	30	30	Lawrence	0	0
Bedford	0	0	Lebanon	14	14
Berks	75	75	Lehigh	136	117
Blair	32	32	Luzerne	68	68
Bradford	12	12	Lycoming	17	17
Bucks	90	82	McKean	9	9
Butler	33	33	Mercer	56	38
Cambria	24	24	Mifflin	12	12
Carbon	0	0	Monroe	20	20
Centre	11	11	Montgomery	218	218
Chester	93	85	Montour	25	25
Clarion	13	11	Northampton	9	9
Clearfield	18	18	Northumberland	0	0
Clinton	0	0	Philadelphia	272	237
Columbia	14	14	Potter	7	5
Crawford	10	10	Schuylkill	9	9
Cumberland	42	36	Somerset	13	0
Dauphin	66	66	Susquehanna	0	0
Delaware	58	46	Tioga	3	3
Elk	4	4	Union	16	16
Erie	70	60	Venango	10	10
Fayette	0	0	Warren	10	10
Franklin	39	39	Washington	17	17
Fulton	0	0	Wayne	11	11
Greene	0	0	Westmoreland	23	23
Huntingdon	0	0	Wyoming	0	0
Indiana	17	17	York	69	54

The most recent data available on the number of NICU and OB beds comes from 2019. However, it is instructive to examine the change in OB-licensed beds from 2016 to 2019. Of all counties that had OB beds in 2016, only four increased the number of beds: Lehigh,

Lackawanna, McKean, and Wayne. The remainder lost beds, with Mercer County losing 24 beds and Lawrence County losing 18.

Figure 18: Change in Licensed Obstetrics Beds, 2016-2019



Data source: Pennsylvania Department of Health, Health Facilities Data.

Vital statistics data counts births based on the county of residence of the mother. However, not all mothers give birth in their county of residence. In rural counties, in particular, the closest hospital may be in another county. Sometimes a family may require or prefer higher-level services at a larger hospital in an urban county. Figure 19 and Table 15 compare the number of births recorded to county residents from EDDIE data versus the number of births

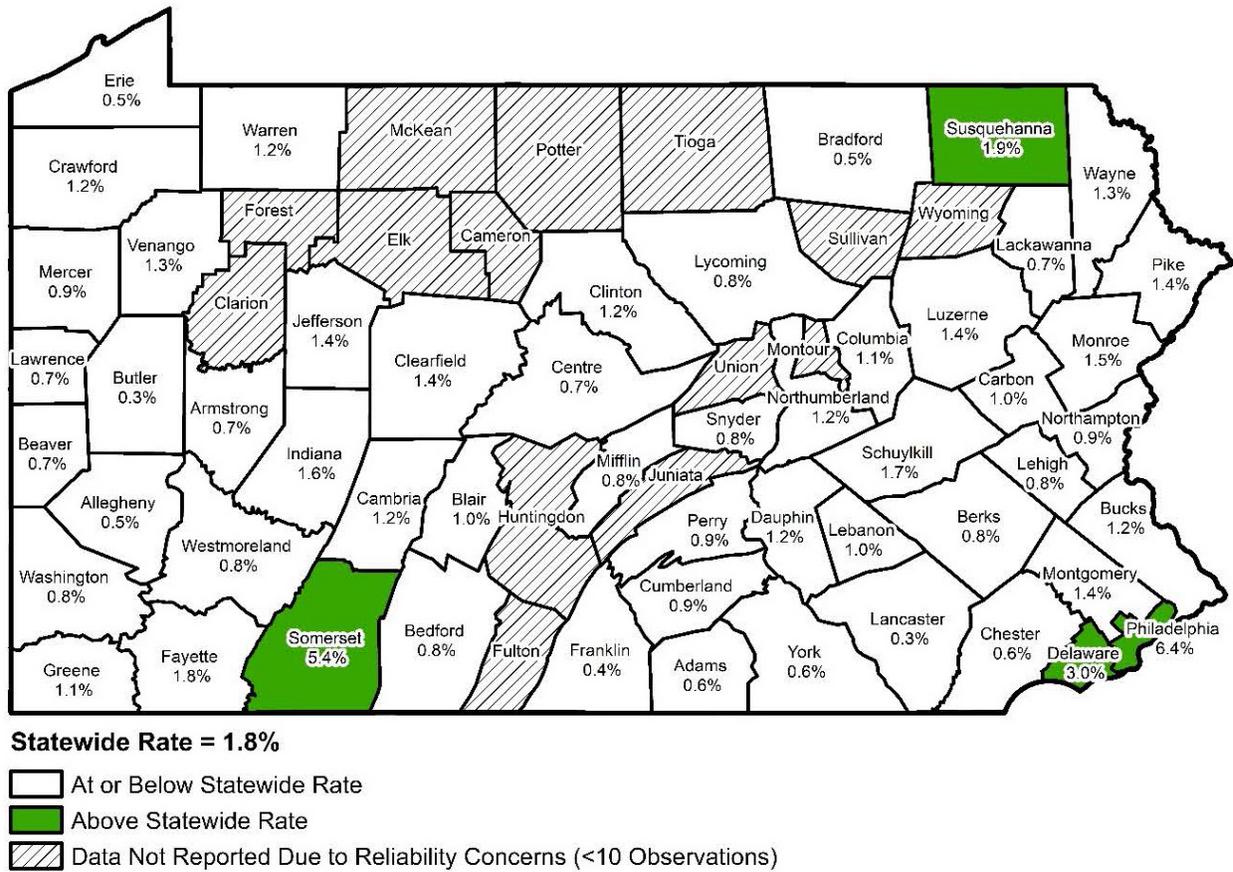
Table 15: Birth Influx and Outflow, 2019 (County Hospital Births – County Resident Births)

County	Difference in County Resident and County Hospital Births	County	Difference in County Resident and County Hospital Births	County	Difference in County Resident and County Hospital Births
Adams	-495	Elk	-76	Montgomery	5566
Allegheny	5841	Erie	496	Montour	1758
Armstrong	-221	Fayette	-830	Northampton	-2488
Beaver	-632	Forest	-35	Northumberland	-922
Bedford	-455	Franklin	-38	Perry	-544
Berks	-606	Fulton	-140	Philadelphia	-2967
Blair	451	Greene	-324	Pike	-399
Bradford	92	Huntingdon	-371	Potter	38
Bucks	-1313	Indiana	-289	Schuylkill	-674
Butler	-684	Jefferson	-378	Snyder	-399
Cambria	466	Juniata	-263	Somerset	-622
Cameron	-25	Lackawanna	183	Sullivan	-54
Carbon	-525	Lancaster	-811	Susquehanna	-359
Centre	168	Lawrence	-823	Tioga	-232
Chester	417	Lebanon	-884	Union	330
Clarion	-290	Lehigh	4602	Venango	146
Clearfield	361	Luzerne	164	Warren	-119
Clinton	-405	Lycoming	-33	Washington	-1201
Columbia	-124	McKean	-271	Wayne	59
Crawford	-380	Mercer	231	Westmoreland	-1756
Cumberland	-1236	Mifflin	28	Wyoming	-239
Dauphin	2783	Monroe	-493	York	-718
Delaware	-3390				

Health Outcomes: Data on health outcomes were accessed from EDDIE. In counties with small populations, there may not be enough data available to calculate certain statistics. In the maps in this section, areas with insufficient data are noted by gray shading and “ND” in the tables. To simplify map interpretation, the statistical significance of each number is not provided; counties are merely highlighted regarding their status above or at or below the state average or rate.

As seen in the results from Goal 1, maternity care deserts occur in rural Pennsylvania. A key indicator of access to maternity care is whether women can obtain maternity care in the first trimester of pregnancy, when fetal development is at a critical stage and education on healthy behaviors can influence the course of the pregnancy. A county-by-county review of the three-year average percent of women who accessed prenatal care in the first trimester highlights lower-than-expected rates in Susquehanna, Fayette, and Somerset counties.

Figure 20. Percent of Births with No Prenatal Care, 2017-2019 average



Data source: Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE).

Table 16: Percent of Births with No Prenatal Care, 2017-2019 average

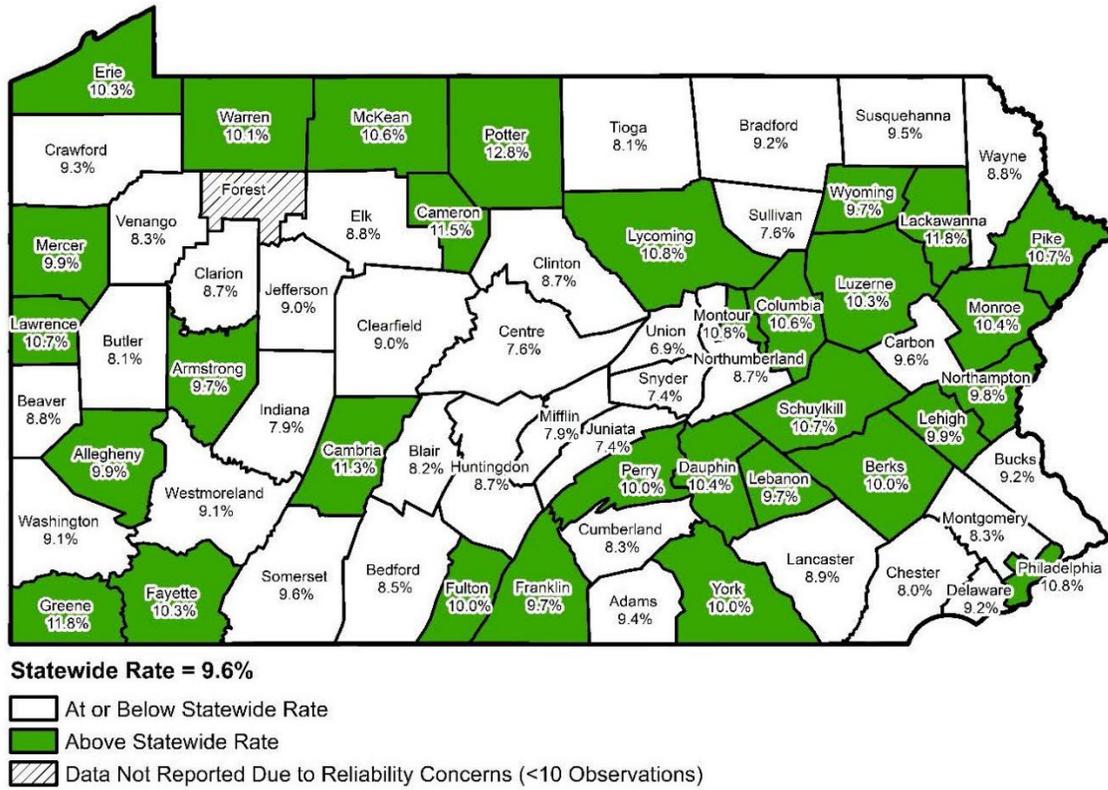
County	Percent No Prenatal Care	County	Percent No Prenatal Care	County	Percent No Prenatal Care
Pennsylvania	1.8	Delaware	3.0	Montgomery	1.4
Adams	0.6	Elk	ND	Montour	ND
Allegheny	0.5	Erie	0.5	Northampton	0.9
Armstrong	0.7	Fayette	1.8	Northumberland	1.2
Beaver	0.7	Forest	ND	Perry	0.9
Bedford	0.8	Franklin	0.4	Philadelphia	6.4
Berks	0.8	Fulton	ND	Pike	1.4
Blair	1.0	Greene	1.1	Potter	ND
Bradford	0.5	Huntingdon	ND	Schuylkill	1.7
Bucks	1.2	Indiana	1.6	Snyder	0.8
Butler	0.3	Jefferson	1.4	Somerset	5.4
Cambria	1.2	Juniata	ND	Sullivan	ND
Cameron	ND	Lackawanna	0.7	Susquehanna	1.9
Carbon	1.0	Lancaster	0.3	Tioga	ND
Centre	0.7	Lawrence	0.7	Union	ND
Chester	0.6	Lebanon	1.0	Venango	1.3
Clarion	ND	Lehigh	0.8	Warren	1.2
Clearfield	1.4	Luzerne	1.4	Washington	0.8
Clinton	1.2	Lycoming	0.8	Wayne	1.3
Columbia	1.1	McKean	ND	Westmoreland	0.8
Crawford	1.2	Mercer	0.9	Wyoming	ND
Cumberland	0.9	Mifflin	0.8	York	0.6
Dauphin	1.2	Monroe	1.5		

**ND indicates counties for which there is not enough data to calculate a reliable statistic. Data source: EDDIE.*

A closer look at maternal child health data for Pennsylvania illustrates the health disparities between urban and rural counties.

Infants born preterm are at immediate risk for life-threatening complications and lifelong risk for physical, emotional, and intellectual development disorders. A review of the three-year average of preterm infants from 2017-2019 illustrates high rates of pre-term birth in several rural counties, highlighted in green in Figure 21.

Figure 21: Percent of All Births that Were Preterm, 2017-2019 average



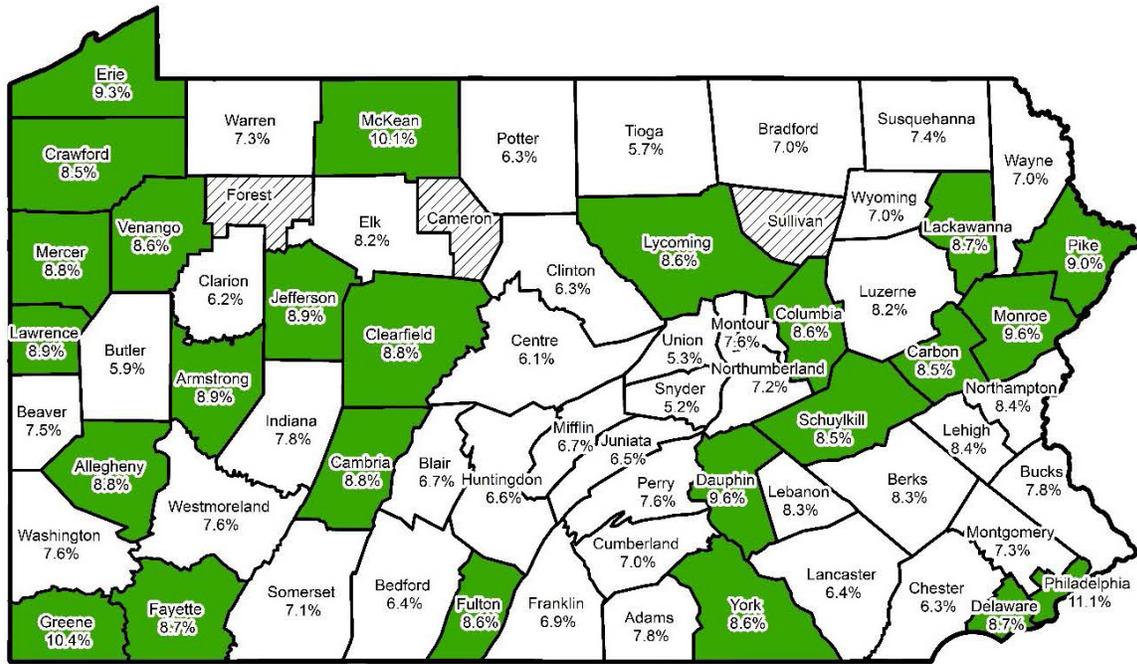
Data source: Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE).

Table 17: Percent of All Births That Were Pre-term, 2017-2019 average

County	Percent Preterm Births	County	Percent Preterm Births	County	Percent Preterm Births
PA Average	9.6	Delaware	9.2	Montgomery	8.3
Adams	9.4	Elk	8.8	Montour	10.8
Allegheny	9.9	Erie	10.3	Northampton	9.8
Armstrong	9.7	Fayette	10.3	Northumberland	8.7
Beaver	8.8	Forest	ND	Perry	10.0
Bedford	8.5	Franklin	9.7	Philadelphia	10.8
Berks	10.0	Fulton	10.0	Pike	10.7
Blair	8.2	Greene	11.8	Potter	12.8
Bradford	9.2	Huntingdon	8.7	Schuylkill	10.7
Bucks	9.2	Indiana	7.9	Snyder	7.4
Butler	8.1	Jefferson	9.0	Somerset	9.6
Cambria	11.3	Juniata	7.4	Sullivan	7.6
Cameron	11.5	Lackawanna	11.8	Susquehanna	9.5
Carbon	9.6	Lancaster	8.9	Tioga	8.1
Centre	7.6	Lawrence	10.7	Union	6.9
Chester	8.0	Lebanon	9.7	Venango	8.3
Clarion	8.7	Lehigh	9.9	Warren	10.1
Clearfield	9.0	Luzerne	10.3	Washington	9.1
Clinton	8.7	Lycoming	10.8	Wayne	8.8
Columbia	10.6	McKean	10.6	Westmoreland	9.1
Crawford	9.3	Mercer	9.9	Wyoming	9.7
Cumberland	8.3	Mifflin	7.9	York	10.0
Dauphin	10.4	Monroe	10.4		

Low birthweight (LBW) is a risk factor for infant mortality and is associated with prematurity (birth before 37 weeks of gestation) and problems with fetal growth. Similarly, a review of the three-year average of all infants with low birth weight from 2017-2019 highlights ongoing disparities among a few rural counties. Cambria, Clearfield, Fayette, Greene, and Venango counties have high rates of low birthweight infants.

Figure 22: Percent of Births that Were LBW, 2017-2019



Statewide Rate = 8.4%

- At or Below Statewide Rate
- Above Statewide Rate
- Data Not Reported Due to Reliability Concerns (<10 Observations)

Data source: Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE).

Table 18: Percent of Births that Were LBW, 2017-2019

County	Percent of Low Birth Weight	County	Percent of Low Birth Weight	County	Percent of Low Birth Weight
PA Average	8.5	Delaware	8.7	Montgomery	7.3
Adams	7.8	Elk	8.2	Montour	7.6
Allegheny	8.8	Erie	9.3	Northampton	8.4
Armstrong	8.9	Fayette	8.7	Northumberland	7.2
Beaver	7.5	Forest	ND	Perry	7.6
Bedford	6.4	Franklin	6.9	Philadelphia	11.1
Berks	8.3	Fulton	8.6	Pike	9.0
Blair	6.7	Greene	10.4	Potter	6.3
Bradford	7.0	Huntingdon	6.6	Schuylkill	8.5
Bucks	7.8	Indiana	7.8	Snyder	5.2
Butler	5.9	Jefferson	8.9	Somerset	7.1
Cambria	8.8	Juniata	6.5	Sullivan	ND
Cameron	ND	Lackawanna	8.7	Susquehanna	7.4
Carbon	8.5	Lancaster	6.4	Tioga	5.7
Centre	6.1	Lawrence	8.9	Union	5.3
Chester	6.3	Lebanon	8.3	Venango	8.6
Clarion	6.2	Lehigh	8.4	Warren	7.3
Clearfield	8.8	Luzerne	8.2	Washington	7.6
Clinton	6.3	Lycoming	8.6	Wayne	7.0
Columbia	8.6	McKean	10.1	Westmoreland	7.6
Crawford	8.5	Mercer	8.8	Wyoming	7.0
Cumberland	7.0	Mifflin	6.7	York	8.6
Dauphin	9.6	Monroe	9.6		

Data source: Pennsylvania Department of Health, Enterprise Data Dissemination Informatics Exchange (EDDIE).

The Healthy People 2020 target for infant mortality was 6.0 infant deaths per 1,000 live births or fewer. By 2017, the United States as a whole had already exceeded this target, while Pennsylvania had not achieved it. Of the 10 Pennsylvania counties with the highest rate of infant deaths, seven were rural counties (University of Wisconsin, 2019). A review of the three-year rolling infant mortality rate (IMR) from 2017-2019 highlights ongoing disparities among several rural counties.

Table 19: Infant Mortality Rates, 2017-2019 Average

County	Infant Mortality Rate	County	Infant Mortality Rate	County	Infant Mortality Rate
Pennsylvania	6.0	Delaware	6.7	Montgomery	4.1
Adams	5.9	Elk	ND	Montour	ND
Allegheny	6.0	Erie	6.7	Northampton	5.0
Armstrong	7.2	Fayette	7.1	Northumberland	4.7
Beaver	7.9	Forest	ND	Perry	6.4
Bedford	ND	Franklin	4.6	Philadelphia	7.9
Berks	7.0	Fulton	ND	Pike	ND
Blair	5.3	Greene	ND	Potter	ND
Bradford	6.2	Huntingdon	12.0	Schuylkill	8.9
Bucks	3.7	Indiana	ND	Snyder	ND
Butler	4.7	Jefferson	ND	Somerset	4.9
Cambria	6.5	Juniata	ND	Sullivan	ND
Cameron	ND	Lackawanna	6.0	Susquehanna	9.0
Carbon	ND	Lancaster	5.4	Tioga	ND
Centre	5.2	Lawrence	5.7	Union	ND
Chester	3.8	Lebanon	4.8	Venango	9.4
Clarion	ND	Lehigh	5.8	Warren	ND
Clearfield	8.7	Luzerne	6.0	Washington	5.6
Clinton	ND	Lycoming	6.4	Wayne	ND
Columbia	ND	McKean	ND	Westmoreland	5.0
Crawford	9.8	Mercer	5.4	Wyoming	ND
Cumberland	4.9	Mifflin	8.6	York	5.0
Dauphin	7.0	Monroe	6.0		

Table 20 highlights associations among infant mortality, ratio of providers to women, and change in OB beds in the county.

Table 20: Infant Mortality Rate, Provider Ratio, and Change in OB Beds Set-up, 2017-2019

	Infant Mortality 2016 -2019	2019 ratio of providers per 10,000 women	Change in OB Beds Set-up 2016- 2019
ALL RURAL		24.80	
Adams	5.9	20.12	0
Allegheny	6.0	36.52	-24
Armstrong	7.2	17.97	2
Beaver	7.9	25.07	0
Bedford	ND	15.09	-3
Berks	7.0	24.87	0
Blair	5.3	42.31	0
Bradford	6.2	44.26	0
Bucks	3.7	26.59	-4
Butler	4.7	21.69	0
Cambria	6.5	45.89	-2
Cameron	ND	34.64	N/A
Carbon	ND	18.78	0
Centre	5.2	23.18	0
Chester	3.8	29.65	-5
Clarion	ND	17.74	-1
Clearfield	8.7	24.58	0
Clinton	ND	15.79	-10
Columbia	ND	19.95	-7
Crawford	9.8	30.09	2
Cumberland	4.9	30.26	1
Dauphin	7.0	39.92	0
Delaware	6.7	23.55	-9
Elk	ND	24.91	0
Erie	6.7	38.78	-6
Fayette	7.1	16.82	-13
Forest	ND	0.00	NA
Franklin	4.6	27.96	0
Fulton	ND	4.30	0
Greene	ND	22.03	0
Huntingdon	12.0	17.13	-12
Indiana	ND	18.61	-1
Jefferson	ND	24.23	0
Juniata	ND	12.32	N/A
Lackawanna	6.0	17.01	11
Lancaster	5.4	36.10	-8
Lawrence	5.7	18.54	0
Lebanon	4.8	30.93	-2
Lehigh	5.8	42.62	2

Luzerne	6.0	29.63	11
Lycoming	6.4	41.18	0
McKean	ND	21.37	9
Mercer	5.4	22.72	2
Mifflin	8.6	39.55	0
Monroe	6.0	11.36	0
Montgomery	4.1	39.64	-6
Montour	ND	159.04	0
Northampton	5.0	28.25	0
Northumberland	4.7	18.71	0
Perry	6.4	11.80	N/A
Philadelphia	7.9	22.85	-20
Pike	ND	8.49	N/A
Potter	ND	20.39	0
Schuylkill	8.9	17.26	-3
Snyder	ND	18.88	N/A
Somerset	4.9	20.00	0
Sullivan	ND	0.00	N/A
Susquehanna	9.0	15.43	0
Tioga	ND	20.59	0
Union	ND	38.69	0
Venango	9.4	18.25	0
Warren	ND	24.01	0
Washington	5.6	34.50	0
Wayne	ND	15.59	5
Westmoreland	5.0	32.73	1
Wyoming	ND	23.24	0
York	5.0	31.37	-20

Four rural counties have elevated infant mortality rates, a supply of providers lower than the average of rural counties, and no change or a decrease in OB hospital beds: Fayette, Schuylkill, Susquehanna, and Venango.

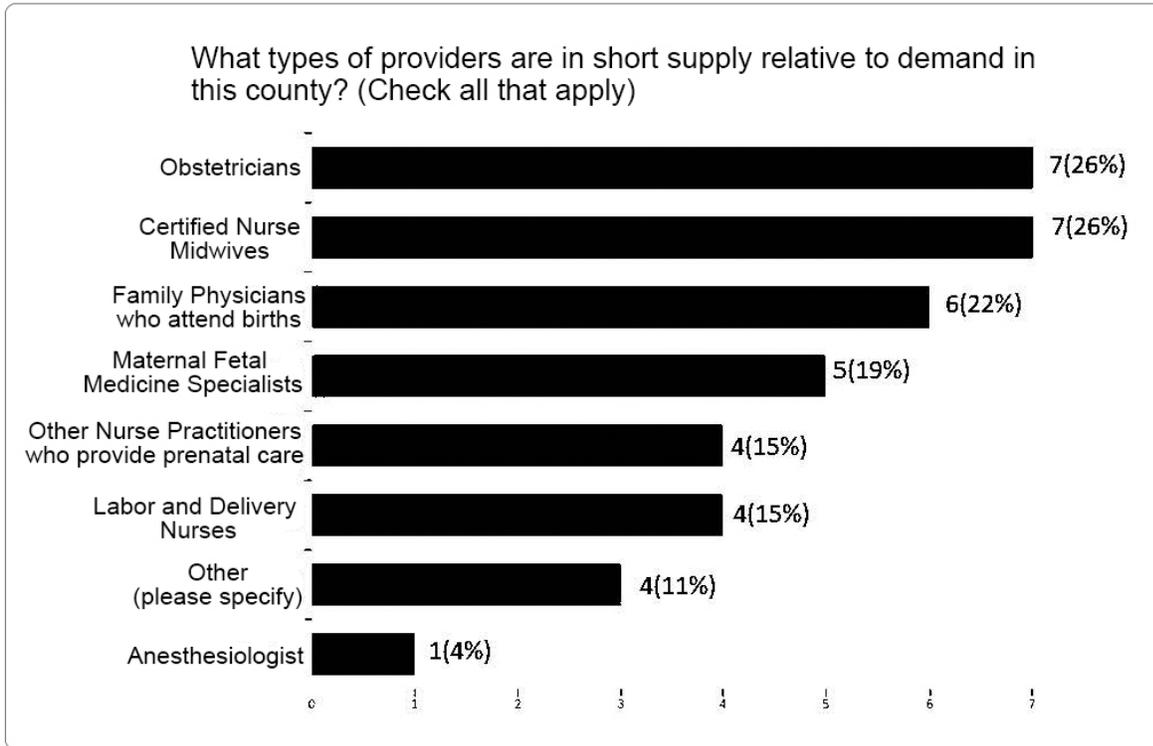
Note: Multiple factors contribute to infant mortality, including the social determinants of health such as access to good jobs, health insurance, and education, resources that may be limited in rural areas. In addition, exposure to discrimination-related stress is a risk factor for poor birth outcomes among women of color. No statistical tests have been performed to identify whether rates portrayed in this table are statistically significant. No statistical tests have been conducted on the relationship between infant mortality and access to maternity care. Correlation is not causation.

Goal 3: Situation Analysis

Most respondents to the stakeholder survey had been employed in Pennsylvania for more than three years. Respondents came from a variety of professions and employers, but most were health care providers. Those who marked “other” as their profession included doulas, childbirth educators, and rural health advocates. Ten rural counties were represented in the responses. A proportion of respondents did not indicate a rural county as their place of employment, probably because some of these individuals were employed by health systems, professional organizations, and universities located in more urban areas. Demographics of respondents can be found in the appendix.

More than a quarter of respondents noted that OB/GYNs and midwives were in short supply, while 21 percent noted that family physicians who attend births were insufficient to meet demand. Maternal fetal medicine specialists, labor and delivery nurses, and other nurse practitioners were among the providers mentioned. For those who selected “other,” suggestions included lactation consultants, Certified Professional Midwives, and pediatricians. Lack of support for breastfeeding was noted as a need in the Title V Maternal and Child Health Services Block Grant report as well (Pennsylvania Department of Health, 2020).

Figure 24: Perceived Provider Shortages



The following major themes and subthemes were identified in the stakeholder survey and key informant interviews.

Figure 25: Themes from Stakeholder Survey

Lifestyle

- Recreation, nature, scenery
- Towns with character
- Slow pace
- Quality schools
- Rural culture may not be appealing to urban dwellers/well-educated professionals

Infrastructure

- Access to larger cities in the mid-atlantic region when needed/desired
- Internet service makes telework an option for spouses/family members of rural health care workers
- Broadband access is not available in some rural communities
- Increased opportunities in telehealth
- Lack of public transportation
- Lack of community-based birth settings (freestanding birth centers)

Economy

- Low cost of living
- Low wages/low income
- Limited opportunities for family members of new hires
- High cost of malpractice

Education

- Need for greater collaboration between health professional schools and communities
- High cost of clinical education/student loan debt
- Need to raise community awareness about maternal child health

Policy

- Modernize regulation/licensing of all birth attendants
- Increase funding for rural communities
- Incentivize collaboration among providers to improve patient care

Literature Review: Access to maternity care in rural areas is a challenge not only for Pennsylvania, but also across the U.S. State governments and healthcare systems have developed initiatives to increase access and improve care for rural childbearing families. A review of the literature generated some evidence-informed approaches that have the potential to be successful. These approaches include innovative service delivery models and the education and funding streams necessary to support those models.

One potential service model is to promote interprofessional maternity care teams and foster collaboration. For example, practices could use team-based (physician and midwife) collaborative care (CMS 2019; Lagrew & Jenkins, 2014b; March of Dimes, 2020), whereby midwives care for most clients and physicians can focus on women who need higher-level care. Both physicians and midwives can offer group prenatal care, an evidence-based approach where multiple women obtain care at the same time and serve as a support group for each other (CMS 2019; Lagrew & Jenkins, 2014b; March of Dimes, 2020). This model has the potential to improve care while increasing the number of clients seen by a provider in a day.

Communities could also increase the use of doulas, professional childbirth coaches who provide support for women in labor. Although they do not provide clinical care, doulas offer clients health education and advocacy, and their use has been shown to improve outcomes and reduce costs for maternity care. (CMS 2019; Lagrew & Jenkins, 2014b; March of Dimes, 2020),

In addition, access to maternity care can be obtained outside of traditional clinic or hospital venues. For example, the Matsu Midwifery program in Alaska includes a birth center and family health clinic where most maternity care can be provided (CMS, 2019). The University of Texas Medical Branch (UTMB) Regional Maternal & Child Health Program provides a Regional Perinatal Residence to house high-risk women and their support persons

when they come for visits to the medical center that do not require hospitalization (CMS, 2019). They also provide transportation for clients who need it.

In placing maternity care resources in local communities, the goal is to facilitate consultation and transfer of care as appropriate so that lower-risk women are able to stay in their communities while women at high risk for complications can access care in hospitals that are able to provide the necessary level of specialized care (Kilpatrick et al., 2019). The UTMB Regional Maternal & Child Health Program also serves geographically underserved women with a network of off-site clinics. Another example is a collaboration between the Arkansas Medicaid Program, the University of Arkansas for Medical Sciences, and the state's medical community to enhance primary obstetric care in rural Arkansas (ACOG, 2014; CMS, 2019).

Both rural health networks mentioned (Texas and Arkansas) use telemedicine to connect rural health clinics with specialty services at the hospital (CMS, 2019). In North Carolina, Cone Health uses telehealth to remotely monitor blood glucose readings of pregnant women at risk for gestational diabetes (CMS, 2019). Increasingly, telemedicine is used to provide collaboration between rural community-based facilities and hospitals in urban areas. However, the use of telemedicine can be limited by the lack of high-speed internet in some rural areas.

Facilities cannot provide access to services if they are not appropriately staffed, so development of practice models will not improve rural maternity care without an adequate workforce and pipeline for future providers. To address this problem, the Health Profession Rural Summer Immersion Program exposed medical and physician assistant students to rural health care practices and a rural lifestyle in Connecticut and New York, which increased participants' intentions to practice in a rural area (Rural Health Information Hub, 2021). Kearny County Hospital in Kansas changed its recruitment model to include paid time off for doctors

and midlevel providers to provide pro bono services in developing countries. They also provide medical school loan forgiveness.

Financial incentives can be offered on a statewide level, as well. For example, Oregon offered a state income tax credit and subsidy for medical liability insurance to rural obstetricians (ACOG, 2014; CMS, 2019). Recipients cited the program as an important reason they were able to continue offering maternity care. In 2014, Georgia established a Preceptor Tax Incentive Program that gives state tax deductions to physicians in the community for training medical professionals (CMS, 2019). Similar programs could be expanded beyond physicians to other maternal health care workers, including midwives and labor and delivery nurses, among others (CMS, 2019).

A common theme shared by all these initiatives is the need to develop innovative models of health care financing. Just as the challenges of rural maternity care access require innovative thinking about care models, health care reimbursement models need to keep pace. All these proposed solutions would require payment reform that compensates providers appropriately for these new models of care (Anderson et al., 2019; Lagrew & Jenkins, 2014b).

In 2019 and 2021, HRSA funded the Rural Maternity and Obstetrics Management Strategies (RMOMS) Program, a demonstration project for building networks to coordinate the continuum of care for pregnant persons (see <https://www.hrsa.gov/rural-health/community/rmoms>). Evaluations of these projects will provide more evidence about which strategies work to improve access to care while maintaining financial viability.

Conclusions

Goal 1: Supply, Demand, and Gap Analysis

Demand: The population of women of childbearing age in Pennsylvania has decreased since 1999 and is forecast to continue doing so for the foreseeable future. Similarly, the number of pregnancies and births to rural woman has been on the decline, as well. Therefore, demand for maternity and obstetric services in rural Pennsylvania counties has been on the decline for some time and is expected to continue to fall in the future.

Supply: Eighteen rural Pennsylvania counties currently are or are expected to be maternity care deserts (March of Dimes, 2020), with low levels of maternity care providers per births. Future projections indicate an increase in the number of providers available in these areas, but the increase in supply is not sufficient to move these counties out of “maternity desert” status. Most notably, there is not projected to be an increase in OB/GYNs relative to demand; the increase comes from CNMs, as well as family physicians who may choose to attend births.

Gap Analysis: Most rural Pennsylvania counties will maintain their recent levels of providers per 2,500 women of childbearing age through 2025, with many counties projected to see increases in these services. Of course, this increase is mostly explained by expected population decreases in these counties rather than an increase in practitioners. One important caveat to this analysis is that it did not consider retirement of practitioners through 2025; if retirements increase, then the number of providers per capita will decrease. Another important caveat is that some rural Pennsylvania counties fell within the category of “maternity care desert” as identified by March of Dimes (2020), so maintenance of the status quo merely continues the gap between supply and demand. Eighteen rural Pennsylvania counties will remain or become maternity care deserts by 2025.

Goal 2: Health Outcomes and Facilities

As of April 2021, Pennsylvania had 16 critical access hospitals, 70 rural health clinics, 99 FQHC sites located outside of urban areas, and 35 short-term hospitals located outside of urban areas (Rural Health Information Hub, 2021).

Nineteen rural counties have hospitals that do not have obstetrics facilities. Women who live in these counties must travel to the closest hospital with obstetric services when in labor. Of all counties that had OB beds in 2016, only four had increases in the number of beds: Lehigh, Lackawanna, McKean, and Wayne. The remainder lost beds, with Mercer County losing 24 beds and Lawrence County losing 18. As noted earlier, no accredited freestanding birth centers are in rural counties. Thirty-one rural counties have no NICUs, which means that infants with complications must be transported to the closest regional hospital with NICU services.

Goal 3: Situation Analysis

Survey responses from stakeholders identified lifestyle issues, infrastructure, economy, and education in rural areas as both strengths and challenges for recruitment of health care practitioners. Their policy suggestions for addressing these issues included increased funding for rural communities (in multiple areas, not just health care), modernizing licensing of health care practitioners, and creating incentives for innovative models of care. Similarly, a review of the literature generated some evidence-informed approaches that have the potential to be successful in increasing access to maternity care. These approaches include innovative service delivery models (including interprofessional collaboration, inter-organizational collaboration, and placing services in rural communities) and the education and funding streams necessary to support those models.

Policy Considerations

Ensuring access to maternity care helps the state fulfill its role in ensuring the health of its citizens, since maternal child health has far-reaching implications for the health of families and communities. The state can play an important role in ensuring access to maternity care in rural areas by providing funding and technical support for evidence-based practices. Another important role for the state is in licensing, credentialing, and scope of practice regulations for maternity care practitioners. Enabling all maternity care providers to work at the top of their scope of practice can improve quality and reduce costs (Kozhimannil et al., 2016; March of Dimes, 2020). State Medicaid programs can play a unique role in ensuring access to maternity care by examining and modifying coverage, benefits, reimbursement, payment policies, and managed care arrangements, as needed to ensure an adequate workforce supply and the sustainability of birthing facilities (Kozhimannil et al., 2016).

The findings and conclusions of this study identified three areas for further examination and development of policy solutions:

- **Recruit more maternity care providers to work in rural areas**

Although the demand for maternity care in rural Pennsylvania is forecast to decrease through 2025, 18 counties currently are or are projected to be short on maternity care providers per capita. The Pennsylvania General Assembly may want to consider convening a working group to identify evidence-based practices for recruiting maternity care providers to rural areas of the Commonwealth and disseminate these practices to health care systems serving rural communities. Several options for consideration have been outlined in the results and conclusions for Goal 3 in this report.

- **Encourage innovation in interprofessional maternity care models**

Recognizing that the projected growth in rural maternity care providers will tend to be non-physician providers such as midwives, and advanced practice nurse practitioners, health care systems and nonprofit maternity care organizations may consider developing innovative models of delivering maternity care that involve these practitioners. Other professions such as doulas, health educators, lactation consultants and other community-based health professionals can provide support and supplementary services to primary maternity care providers. Such innovative models may require a re-examination of licensing requirements by the General Assembly and modification of reimbursement models by Medical Assistance and private insurers.

- **Strategically maintain and place resources for maternity care in locations where they are scarce**

Placing maternity care resources in local communities facilitates consultation and transfer of care as appropriate so lower-risk women can stay in their communities while women at high risk for complications can access care in hospitals that are able to provide the necessary level of specialized care. The General Assembly may wish to examine the role FQHCs, rural health clinics, and critical access hospitals play in providing access to maternity care, and, in conjunction with Medical Assistance, assess the funding mechanisms necessary to sustain these resources. Similarly, the legislature could call for an evaluation of how freestanding birth centers and other community-based maternity care providers broaden access to quality maternity care and identify licensing and funding mechanisms to support these organizations. In addition to physical facilities, providers can bring maternity care to rural areas using telehealth; such access is predicated on the availability of broadband in rural communities. The Commonwealth can

identify lessons learned from the expansion of telehealth during the COVID-19 pandemic to identify mechanisms that make telehealth a sustainable method for care delivery going forward.

References

American Association of Birth Centers. (2016). *Find a Birth Center*.

<https://www.birthcenters.org/search/newsearch.asp>.

American College of Obstetricians and Gynecologists (ACOG). (2014) Health disparities in rural women. Committee Opinion No. 586. *Obstetrics and Gynecology*, 123:384–8.

Anderson, B., Gingery, A, McClellan, M., Rose, R. Schmitz, D. & Schou, P. (2019). *NRHA Policy Paper: Access to Rural Maternity Care*. National Rural Health Association.

https://www.ruralhealthweb.org/NRHA/media/Emerge_NRHA/Advocacy/Policy%20documents/01-16-19-NRHA-Policy-Access-to-Rural-Maternity-Care.pdf.

Birth Place Lab. (2019). *Midwifery Integration State Scoring System Report Card: Pennsylvania*

<https://www.birthplacelab.org/wp-content/uploads/2019/03/Pennsylvania.pdf>.

Center for Connected Health Policy. The National Telehealth Policy Resource. (2021). *Current*

State Laws and Reimbursement Policies. [https://www.cchpca.org/telehealth-](https://www.cchpca.org/telehealth-policy/current-state-laws-and-reimbursement-policies?jurisdiction=67&category=All&topic=All)

[policy/current-state-laws-and-reimbursement-](https://www.cchpca.org/telehealth-policy/current-state-laws-and-reimbursement-policies?jurisdiction=67&category=All&topic=All)

[policies?jurisdiction=67&category=All&topic=All.](https://www.cchpca.org/telehealth-policy/current-state-laws-and-reimbursement-policies?jurisdiction=67&category=All&topic=All)

Centers for Medicare and Medicaid Services (CMS). (2019) *Improving Access to Maternal*

Health Care in Rural Communities An Issue Brief [https://www.cms.gov/About-](https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/Improving-Access-to-Maternal-Health-Care-in-Rural-Communities-An-Issue-Brief.pdf)

[CMS/Agency-Information/OMH/Downloads/Improving-Access-to-Maternal-Health-](https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/Improving-Access-to-Maternal-Health-Care-in-Rural-Communities-An-Issue-Brief.pdf)

[Care-in-Rural-Communities-An-Issue-Brief.pdf](https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/Improving-Access-to-Maternal-Health-Care-in-Rural-Communities-An-Issue-Brief.pdf).

- Dall, T. West, R., Chakrabarti, R., Reynolds, K., & Iacobucci, W (2020). *The Complexities of Physician Supply and Demand: Projections From 2018 to 2033*. American Association of Medical Colleges. Washington, DC. <https://www.aamc.org/system/files/2020-06/stratcomm-aamc-physician-workforce-projections-june-2020.pdf>.
- David, F. (1993). *Strategic Management, 4th Ed.* New York, NY: Macmillan Publishing Company.
- Kiger, M.E. & Varpio, L. (2020) Thematic analysis of qualitative data: AMEE *Guide No. 131, Medical Teacher, 42:8*, 846-854, DOI: 10.1080/0142159X.2020.1755030.
- Kilpatrick, Sarah J. et al. (2019). Obstetric Care Consensus #9: Levels of Maternal Care *American Journal of Obstetrics & Gynecology; 221(6)*: B19 - B30.
- Kozhimannil, K. B., Henning-Smith, C., Hung, P., Casey, M. M., & Prasad, S. (2016). Ensuring Access to High-Quality Maternity Care in Rural America. *Women's Health Issues, 26(3)*, 247–250. <https://doi.org/10.1016/j.whi.2016.02.001>.
- Lagrew, D. C., & Jenkins, T. R. (2014a). The future of obstetrics/gynecology in 2020: A clearer vision: Finding true north and the forces of change. *American Journal of Obstetrics and Gynecology, 211(6)*, 617-622.e1. <https://doi.org/10.1016/j.ajog.2014.08.021>.
- Lagrew, D. C., Jr, & Jenkins, T. R. (2014b). The future of obstetrics/gynecology in 2020: A clearer vision. Why is change needed? *American Journal of Obstetrics and Gynecology, 211(5)*, 470-474.e1. <https://doi.org/10.1016/j.ajog.2014.08.020>.
- Larson EH, Andrilla CHA, Garberson LA. *Supply and Distribution of the Primary Care Workforce in Rural America: 2019. Policy Brief #167*. WWAMI Rural Health Research Center, University of Washington; June 2020.

- Lewis,C., Paxton,I. & Zephyrin, L. (2019 Aug 15) *The Rural Maternity Care Crisis*. To the Point (blog), The Commonwealth Fund. <https://doi.org/10.26099/j0nn-ap16>.
- March of Dimes. (2020). *Maternity Care Desert Report*. Available from <https://www.marchofdimes.org/materials/2020-Maternity-Care-Report.pdf>.
- National Association of Certified Professional Midwives (NACPM). (2020). *Legal recognition of CPMs*. <https://nacpm.org/about-cpms/who-are-cpms/legal-recognition-of-cpms/>.
- North American Registry of Midwives. (2019) 2019 NARM Annual Report. <https://narm.org/pdffiles/2019NARMAnnualReport.pdf>.
- Patterson DG, Andrilla CHA, Garberson LA. (2020). *The Supply and Rural-Urban Distribution of the Obstetrical Care Workforce in the U.S. Policy Brief #168*. WWAMI Rural Health Research Center, University of Washington.
- Pennsylvania Association of Community Health Centers. (2020). *Pennsylvania Association of Community Health Centers 2020 Annual Report*. <https://www.pachc.org/About-PACHC/Annual-Report>.
- Pennsylvania Department of Health, Bureau of Family Health. (2020). *Title V Maternal and Child Health Services Block Grant: 2020 Needs and Capacity Assessment*.
- Phillippi, J. C., Danhausen, K., Alliman, J., & Phillippi, R. D. (2018). Neonatal Outcomes in the Birth Center Setting: A Systematic Review. *Journal of Midwifery & Women's Health*, 63(1), 68–89. <https://doi.org/10.1111/jmwh.12701>.
- Rural Health Information Hub. (2021) *Rural Maternal Health Toolkit*. <https://www.ruralhealthinfo.org/toolkits/maternal-health>.

Rural Health Research Gateway. *Rural Health Recap* (2019 April).

<https://www.ruralhealthresearch.org/assets/2792-10798/rural-ob-services.pdf>.

Satiani, B., Williams, T., Landon, M. Ellison, C & Gabbe, S (2011). A Critical Deficit of

OB/GYN Surgeons in the U.S by 2030, *Surgical Science*, 2:95-101. doi:

10.4236/ss.2011.22020.

U.S. Department of Health and Human Services, Health Resources and Services Administration,

National Center for Health Workforce Analysis. (2016). *National and Regional*

Projections of Supply and Demand for Women's Health Service Providers: 2013-2025.

Rockville, Maryland.

U.S. Department of Health and Human Services. Health Resources and Services Administration

(HRSA). Federal Office of Rural Health Policy. (2021). *Introducing the Rural Maternity and Obstetrics Management Strategies (RMOMS) Program*.

<https://www.hrsa.gov/sites/default/files/hrsa/ruralhealth/rmoms-fact-sheet.pdf>.

U.S. Department of Health and Human Services. Health Resources and Services Administration

(HRSA).. (2021) Federally Qualified Health Centers.

<https://www.hrsa.gov/opa/eligibility-and-registration/health-centers/fqhc/index.html>

Vedam S, Stoll K, MacDorman M, Declercq E, Cramer R, Cheyney M, et al. (2018) Mapping

integration of midwives across the United States: Impact on access, equity, and

outcomes. *PLoS ONE* 13(2): e0192523. <https://doi.org/10.1371/journal.pone.0192523>.

Wing P, Armstrong DP, Forte GJ, Moore J. [Health Workforce Analysis Guide, 2016 Edition](#).

(2016). Rensselaer, NY: Health Workforce Technical Assistance Center, Center for

Health Workforce Studies, School of Public Health, SUNY Albany.

Wolff, B., Mahoney, F., Lohiniva, A.L., & Corkum, M. (2018). Collecting and analyzing qualitative data. The CDC Field Epidemiology Manual. <https://www.cdc.gov/eis/field-epi-manual/chapters/Qualitative-Data.html>.

Young Center for Anabaptist and Pietist Studies, Elizabethtown College (2020). *Amish Population Profile, 2020*. <http://groups.etown.edu/amishstudies/statistics/amish-population-profile-2020>.

Appendix A: Demographics of Situation Analysis Respondents

The following tables provide a description of the demographics of participants who responded to the survey.

Table A1: Length of Time Employed in Pennsylvania

How long have you worked in Pennsylvania?	N (%)
1 to 3 years	5 (19%)
Less than 1 year	3 (11%)
More than 3 years	19 (70%)
Grand Total	27

Table A2: Occupation of Respondents

Row Labels	Count
Clinical manager	3 (11%)
Education/academic	2 (7%)
Health care provider	10 (37%)
Human resources professional	1 (4%)
Non-clinical management or executive (not HR)	4 (15%)
Non-clinical programmatic/policy staff	2 (7%)
Other (please specify)	5 (19%)
Grand Total	27

Table A3: Employer

Type of Employer	N (%)
Academic/university	1 (4%)
Community-based non-profit agency	3 (11%)
Federally Qualified Health Clinic	1 (4%)
Hospital	4 (15%)
Medical Practice	2 (7%)
Other clinic/rural clinic	1 (4%)
Other (please specify)	4 (15%)
No response	11 (41%)
Grand Total	27

Table A4: County

What RURAL county do you work in MOST of the time or are MOST familiar with?	Count
Cambria	2
Crawford	2
Fulton	1
Indiana	1
Lawrence	1
Lycoming	1
Monroe	2
Union	1
Wayne	1
Wyoming	2
No response	12
Grand Total	27

Appendix B: Glossary

Certified Midwife (CM): Like CNMs, Certified Midwives graduate from programs accredited by the Accreditation Commission for Midwifery Education and hold national certification by the American Midwifery Certification Board. Certified Midwives enter midwifery education from a variety of routes, rather than through undergraduate nursing programs. CMs are not dually licensed as nurses.

Certified Nurse Midwife (CNM): A registered nurse with additional training as a midwife who is certified to deliver infants and provide prenatal and postpartum care, newborn care, and some routine care (as gynecological exams) of women. CNMs complete graduate education in programs accredited by the Accreditation Commission for Midwifery Education and hold national certification by the American Midwifery Certification Board.

Certified Professional Midwives (CPMs): Offer expert care, education, counseling and support to women for pregnancy, birth and the postpartum period. CPMs practice as autonomous health professionals working within a network of relationships with other maternity care providers who can provide consultation and collaboration when needed. All Certified Professional Midwives meet the standards for certification set by the North American Registry of Midwives (NARM). The CPM credential requires that all candidates demonstrate successful mastery of both didactic and clinical knowledge and skills. Currently, routes to the CPM credential include graduation from an education program accredited by the Midwifery Education Accreditation Council or the ACNM Division of Accreditation, or completion of a Portfolio Evaluation Process (PEP), an organized framework to guide and evaluate students who undertake individualized study.

Direct-Entry Midwife (DEM): A direct-entry midwife is a midwife who has become credentialed without first becoming a nurse. There are direct-entry midwifery programs that prepare students to become Certified Nurse Midwives (CNMs) or Certified Professional Midwives (CPMs).

Family physician: Family physicians, through education and residency training, possess distinct attitudes, skills, and knowledge which qualify them to provide continuing and comprehensive medical care, health maintenance and preventive services to each member of the family regardless of gender, age, or type of problem (American Academy of Family Physicians).

Freestanding birth center: A health care facility for childbirth where care is provided in the midwifery and wellness models. The birth center is freestanding and not a hospital. Birth centers are an integrated part of the health care system and are guided by principles of prevention, sensitivity, safety, appropriate medical intervention and cost-effectiveness. While the practice of midwifery and the support of physiologic birth and newborn transition may occur in other settings, this is the exclusive model of care in a birth center. (American Association of Birth Centers).

Infant mortality: The death of an infant before his or her first birthday. The infant mortality rate is the number of infant deaths for every 1,000 live births.

Intrapartum: The time period spanning childbirth, from the onset of labor through delivery of the placenta.

Licensed beds: Hospital beds licensed by the Pennsylvania Department of Health regardless of whether those beds are actually in use. Beds that are set up and staffed are those regularly maintained and available for patients based on the staffing during the reporting period.

Low birth weight: A term used to describe babies who are born weighing less than 5 pounds, 8 ounces (2,500 grams). An average newborn usually weighs about 8 pounds. A low-birth-weight baby may be healthy even though he or she is small. However, a low-birth-weight baby can also have many serious health problems that may increase the risk of infant death. The most common cause of low birth weight is preterm birth.

Neonatal intensive care unit: A nursery in a hospital that provides around-the-clock care to sick or premature babies.

Obstetric/obstetrics/obstetrical: Related to services provided in pregnancy and childbirth.

Obstetrician: A doctor who specializes in pregnancy, childbirth, and a woman's reproductive system. Although other doctors can deliver babies, many women see an obstetrician, also called an OB/GYN. OB/GYNs have graduated from medical school and completed a four-year residency program in obstetrics and gynecology.

Perinatal: Pertaining to the period immediately before and after birth. The perinatal period commences at 22 completed weeks (154 days) of gestation and ends seven completed days after birth. (World Health Organization).

Perinatal Quality Collaboratives (PQCs): Networks of teams working to improve the quality of care for mothers and babies across prenatal, labor/birth, newborn, and postpartum services. These teams are typically comprised of physicians, nurses, midwives, social workers, pharmacists, quality and safety leaders, administrators, and other licensed and unlicensed professionals.

Postpartum/postnatal: The period after birth. The postpartum period can be divided into three distinct stages; the initial or acute phase, 6–12 hours after childbirth; subacute postpartum period, which lasts 2–6 weeks, and the delayed postpartum period, which can last up to

six months. Postpartum typically refers to the mother while postnatal typically refers to the infant.

Prenatal: Occurring or existing before birth. Prenatal care is the regular health care women should receive from an obstetrician or midwife during pregnancy.

Preterm birth: A birth that takes place more than three weeks before the baby's estimated due date—before the start of the 37th week of pregnancy. Premature babies, especially those born very early, often have complicated medical problems.

Regionalization: Refers to a structured system of care that improves patient outcomes by directing patients to facilities with the capabilities that best meet their level of need; e.g., a birth center affiliated with a local hospital networked to a regional hospital with a neonatal intensive care unit (NICU)

Team-based care: Distributes work among multidisciplinary teams of providers (physicians, nurses, midwives, etc.) so physicians provide only the care that requires their training and expertise (Lagrew & Jenkins, 2014a).

Telemedicine/telehealth: The remote diagnosis and treatment of patients by means of telecommunications technology.

Appendix C: Semi-Structured Interview Guide

1. Please tell me about your role related to maternity care in rural Pennsylvania.
2. What are the strengths/resource/assets in _____ County (*or rural PA for state-wide stakeholders*) for providing increased access to maternity care?

Prompt to think about:

- a. Human resources - staff, volunteers, board members, target population
 - b. Physical resources - your location, building, equipment
 - c. Financial - grants, funding agencies, other sources of income
 - d. Activities and processes - programs you run, systems you employ
 - e. Past experiences - building blocks for learning and success
3. What are the barriers in _____ County (*or rural PA for state-wide stakeholders*) for providing increased access to maternity care?

Prompt to think about:

- a. Human resources - staff, volunteers, board members, target population
 - b. Physical resources - your location, building, equipment
 - c. Financial - grants, funding agencies, other sources of income
 - d. Activities and processes - programs you run, systems you employ
 - e. Past experiences - building blocks for learning and success
4. What are the opportunities in _____ County (*or rural PA for state-wide stakeholders*) for providing increased access to maternity care?

Prompt to think about:

- a. Future trends in your field or the culture
- b. The economy - local, national, or international

- c. Funding sources - foundations, donors, legislatures
 - d. Demographics - changes in the age, race, gender, culture of those you serve or in your area
 - e. The physical environment
 - f. Legislation
 - g. Local, national or international events
5. What are the threats in _____ County (or rural PA for state-wide stakeholders) for providing increased access to maternity care?

Prompt to think about:

- a. Future trends in your field or the culture
 - b. The economy - local, national, or international
 - c. Funding sources - foundations, donors, legislatures
 - d. Demographics - changes in the age, race, gender, culture of those you serve or in your area
 - e. The physical environment
 - f. Legislation
 - g. Local, national or international events
6. What solutions could be offered to increase access to maternity care in rural Pennsylvania? We're especially interested in policy solutions.

**Center for Rural Pennsylvania
Board of Directors**

Senator Gene Yaw, *Chairman*

Representative Eddie Day Pashinski, *Vice Chairman*

Dr. Nancy Falvo, *Clarion University of Pennsylvania, Secretary*

Mr. Stephen M. Brame, *Governor's Representative, Treasurer*

Senator Katie J. Muth

Representative Dan Moul

Mr. Richard Esch, *University of Pittsburgh*

Dr. Timothy Kelsey, *Pennsylvania State University*

Ms. Shannon M. Munro, *Pennsylvania College of Technology*

Dr. Charles Patterson, *Shippensburg University of Pennsylvania*

Ms. Susan Snelick, *Northern Pennsylvania Regional College*

Mr. Darrin Youker, *Governor's Representative*

Center for Rural Pennsylvania Staff

Kyle C. Kopko, Ph.D., Executive Director

Jonathan Johnson, Senior Policy Analyst

Christine Caldara Piatos, Communications Manager

Pam Frontino, Program Manager for Grants

Linda Hinson, Office Manager

David W. Martin, Public Policy Data Analyst



625 Forster St., Room 902, Harrisburg, PA 17120

(717) 787-9555 www.rural.pa.gov

1P0422